VOLUME TWO/NUMBER THREE $1.50 PM451

vertex

THE MAGAZINE OF SCIENCE FICTION

ERICH vonDANIKEN INTERVIEWED ■ A PLAY IN THREE ACTS by JOE HALDEMAN ■ SOVIET SPACE STAMP SPECTACULAR ■ CONTINENTAL SHIFT and THE FORGOTTEN PLANET EXAMINED ■ MAJOR STORIES by STEPHEN GOLDIN, HARRY HARRISON, LARRY NIVEN and NEIL SHAPIRO



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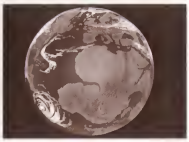


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I'm sure you've noticed that Vertex is on new paper. Gone is the super-slick glossy coated stock. No, but not because we're trying to make more profit off the magazine. Quite the contrary. The stock you're reading this on is *more* expensive than what we have been using.

What you probably haven't noticed is that, along with everything else, there's now a paper shortage. We probably could have continued to use the fancy coated stock, but we would have had to raise the price of the magazine to do it, and, frankly, I couldn't see it.

Like the fuel shortage, the paper shortage is one we should have seen coming. Enough people have been yelling about it for enough years. But, again just as with the fuel crisis, nobody pays any attention to doom-sayers until their predictions have come to pass. Then everyone starts looking for a scapegoat and an easy way out. Well, we've just about run out of both.

Okay, all of the above is a pretty much standard 1974 issue journalistic cop-out. It's the hair shirt, the "Hey, look at me! I'm doing public penance.", the "I was a bad boy, but I ain't gonna sin no more." Almost every editor and columnist in the country is doing it. So what am I doing different?

For one thing, I'm probably going to get my block knocked off for being on the wrong side of the fence. Let it be known by one and all that I do *not* believe in unlimited ecology, that I am *not* in favor of closing down the nuclear plants until they manage to get their emergency cooling and waste disposal problems solved, that I am *not* in favor of banning automobiles until Detroit comes up with a clean burning engine, that I am *not* in favor of banning all pesticides and having everyone live happily ever after on organically grown food only.

Ever since Oog panicked the cave by bringing a fire home for lunch there have been those who would see all progress stopped until someone can gaurantee to them that the progress can be made in 100-percent complete safety. Well, that's not how progress is made, brother. If you ban the production of any new gadget or process until you're absolutely sure it's safe you'll never get it into production. You take what is, *at that time,* an acceptable risk for a measurable gain. If the risk is too high, you don't go into production. But you don't hide under the bed because of *unknown* possible future risks. When DDT was introduced no one knew it would one day be revealed as a general lifeform killer. When the automobile made the U.S. into one country, finishing the job the railroads had started, no one could have predicted the curse of smog. When the atom was developed as the power source of the future no one envisioned the problem of what to do with the wastes.

But now we have these problems, *and we will have to find solutions for them.* But banning them is not the way to solve the problems. It only means you'll have to find substitutes, which themselves will probably create problems we can't even envision now. And you can't stop all new development and turn back to the past because new things might create new problems. Like it or not, we're going to have to solve our problems, and we aren't going to do it by hiding under a bed in a room heated by organic coal, reading by the light of a smelly but non-polluting candle, semi-starving because the bugs are eating the food before we can get to it, hurting because we have no transportation to get us to medical help when we need it. That way lies not just stagnation, but cultural and personal death.

Donald J. Pfeil

Don Pfeil, Editor



SCOREBOARD

fiction / JOHN VARLEY / artist / RODGER MACGOWAN



Neither side could win, but neither could either side quit.

You might as well face it, Lieutenant Stafford. You've been shanghaied."

She still didn't want to believe it, but she would eventually. It's not an easy thing to come to terms with—that you can be signed to a contract as a mining engineer and end up on Ceres, shooting at strangers.. There were eleven billion people back on Earth who didn't know it was legally possible, and fifty thousand on Ceres who thought it really *wasn't* legally possible. Myself included. But future damage suits aside, it was as sure as anything could be that the Outward Bound Mining Company could do it to you, and do it so well that you had to shoot or be killed. If someone didn't shoot, it was my job as an officer to shoot *them.* And that was one of many reasons why Outward Bound wasn't winning the war; I was a subversive.

"For the time being," I went on, "you're much better off if you put thoughts of illegality out of your mind. Concentrate all your energy on staying alive.

"You probably can't see it yet, but you're lucky. If everything goes as planned, this war will be over in another few weeks and we can all go home. It could be worse. You've landed in a soft job, through sheer luck. Your good luck and Lieutenant Garfield's bad." Garfield had been my aide until the day before, when he had bounced into the shooting gallery and gotten his head blown off. Stafford was to be his replacement.

She was a sad sight—I was honestly moved. Twenty-five years old, figuratively clutching a Ph. D. from Cal Tech with the ink still wet, out on her first exciting trip to the asteriods with a responsible job. And on the way in her ship is hit by enemy fire. The people in the compartment next to hers are killed horribly; these are people she has only just gotten to know, people as bright-eyed as her. And then she lands and is handed a uniform, a commission, and a rifle, and told she's in the army now. It was enough to rattle anyone.

"I know you're right, Major," she said, the *Major* coming out only after a conscious effort. "It's all a bit sudden. I can't see how this could be going on. I can't see how it got started, and I can't see how it could go on for . . . seven *years* did you say? . . . and no one knows anything about it."

"No one knows about it because there's no rotation of troops. The only way you'll go home is if you get killed or the war ends. There's no third way. The Company controls all communication and transportation. They warn all the independents off. If some prospector ignores the warning, they shoot him down. No one suspects anything what with the casualty rate in Model-T's."

"What about the bodies they bring back to Earth?"

"I misled you. They don't land and bury them. They drop them into the atmosphere. Neat."

"Too neat." She shivered. It was coming home to her how easy it was to cover things up out here.

"Too neat, *sir.*" I softened it with a smile, and she looked properly sheepish. I *hate* that, turning innocent young men and women into soldiers, but you have to have discipline. I found that out early in the war. Without those military rituals it's hard to get people to do something insane just because you ordered it. I don't like that in myself, that willingness to sacrifice others in large and small ways to insure my own survival, but there it is. It's saved my life three times that I know of.

"As to how it got started and how it keeps going, you can find out for yourself. There are at least fourteen theories and I'd hate to prejudice you with mine. But for now, soldier, here's your first order. Take this stuff over to Colonel Chambers below Delta Trench." I handed her a stack of written reports.

"What is it? Sir."

"You can think of it as 'hard copy,' but it's never seen the inside of a computer. We're primitive in funny ways out here. I think Outward Bound could actually win the war if they'd just hire a battalion of time and motion analysts."

As she started out the door I had a sudden vision of Natasha's death's-head grin on the day she died and was up and out of my chair almost before I knew what I was doing.

"I'd better go with you," I said.

I helped her live through the first hazardous moments of seeing a battle in vacuum. That kills a lot of them. They are told there's a battle going on, but when they get there they can't see or hear anything and are likely to stick their heads up over the trench to see what's going on. She was no exception. She was going to look, so I put a hand on her shoulder and held her down. I pointed to the other side of the trench, where the two-meter-tall hill of gray excavated rock was alive with soundless violence.



No one on Earth knew the war was even going on—except for the companies who were doing their best to keep the war going.

We were in Alpha Trench, only two hundred meters from the enemy, and the fighting was rough.

A battle in vacuum is a nightmare. I think I'd like the traditional din of war better than the silence. All you hear is the hissing of breath over your radio. And then at long intervals, the crack of an impact followed by a receding scream as the air gets thinner and thinner in someone's suit. All this while the mounds behind you are exploding in a thin smoke as thousands of shaped-charge bullets come crashing in.

I led Stafford through the trench, going slowly so she could learn a little about how this war was fought.

Along our right, on the side facing the enemy, was a line of soldiers standing on empty ammunition boxes. The boxes brought them up where they had to crouch slightly to keep the tops of their helmets out of the line of fire. Only their rifles and their ParEyes stuck up over the edge. The rifles were firing almost constantly, whether or not the shooter had a good target. This was standard policy for both sides; keep enough lead in the air so the other side is too busy keeping their heads down to have time to draw a bead on you.

The ParEyes were another example of fuzzy thinking back in the boardroom on Earth. The idea was to give each soldier increased accuracy with the rifle. They stuck up and out from the helmet, giving the Eyes themselves a separation of .7 meters. The Eyes were connected to stereo eyepieces inside the helmets by fiberoptic bundles, and gave the operator a greatly increased parallax.

So what it came down to was that each side kept their heads down and shot off the ParEyes of the other side. When anyone bothered to aim at all.

What a lot of the new recruits wonder is how anyone gets *killed* at all with such abject lack of heroism. The answer that many of them find out the hard way is this: gravity.

Ceres has only one half meter/sec./sec. of surface acceleration, about .05 gee. If you wiggle your toes the right way in your boots, you can lift yourself five or six centimeters off the ground. If your leg muscle twitches you might find yourself two meters in the air, looking at a line of enemy swinging their rifles over at you. A sudden movement, improperly controlled, can send you way into the empty sky to hang for eternal seconds while the other side has all the time in the world to nail you from here to Pluto.

So the veterans are awfully careful about tying themselves down when they mount their boxes for a shift. A veteran is anyone who has lived through two weeks of combat; we lose about twenty percent in that time.

Stafford seemed to be a survivor type, though I was not about to get too friendly with her until she had proved it by surviving a few months. She had shown a shaky familiarity with pressure suits when she put hers on. Most of the new ones don't know which end to put their legs into. That meant that while still on the ship, she had realized how much she would depend on vacuum gear and familiarized herself ahead of time. And in the trench, after her one lapse of almost getting too curious, she moved with none of the confident bravado that so often sends a new one up into the shooting gallery.

Colonel Chambers was worse off than I ever remembered her. She was around fifty-five years old, and was actually beginning to look it, even though our medical care was always first-rate. Liquor was her main problem; or, looked at another way, her only salvation. She cooked it up in great nauseating batches and drank it all herself. Her eyes were usually bloodshot, and were set in a dark mass of wrinkles. She was an Old Ceres Hand, had been here for fourteen years before the war started, and would not let herself be confined into a uniform. She wore odd bits of clothing here and there, and even that was grudging. It was an old habit from the days when suits were so uncomfortable that when you got inside, you ripped everything off and scratched for two hours.

"Colonel Chambers, this is Lieutenant Stafford, just up from Earth."

Stafford saluted clumsily and handed the sheaf of reports to the Colonel. Chambers' eyes strayed vaguely over to Stafford, but she never focused on her. She stared right through her, completely uninterested. When she looked back to me after muttering something vague, the light had returned.

I realized that I had been looking at Stafford in the same way, forced by necessity to acknowledge her existence, but unable to really see her. It was a protective reflex. I no longer got to know anyone until they had survived a few months of combat.

I looked at her now, trying to penetrate the fog that clouded my vision as some part of me struggled *not* to see her. She was pretty with the easy grace of a young woman, but had no real feature that my reluctant eyes could hang her name on. When I looked away I could not remember her face. All I had was an impression of blonde hair that reminded me of Natasha, which was silly, since Natasha's hair had been brown.

"We have an arrival time on that U.N. ship," Chambers told me. "0400 tomorrow. The negotiator is aboard, and the ship has free passage. Consolidated says they won't fire on it, and I'm damn sure *we* won't."

It was the news I had been waiting for. I gave Stafford a big grin, then realized she might not know what we were talking about.

"It means the end of the war," I said. "Or we're all hoping it does. There doesn't seem to be any reason why it *shouldn't* be the end." As I said that I almost started to cry, and was suddenly terribly insecure. "Doesn't it, Marie?"

The Colonel rolled one pinkish eye in my direction. She was in a warm haze and couldn't care less at the moment if the war went on for years. But we helped each other out; she remembered the times when the walls were closing in on her and I had held them back.

"It's a sure thing," she confided. "All you have to do now is wrap up your legal briefs and send them off to a shyster and within a month you'll own one fifty-thousandth of the Outward Bound Mining Company."

It was a recurrent fantasy among our reluctant army. The Great-Big-Day when the war is over and we screw O.B. as totally as they had screwed us. The figure I had settled on for my lawsuit was $100,000,000,000.00. Every time one of my close friends was killed I added an order of magnitude. Except for Natasha. For Natasha I would personally take Outward Bound and the whole bloody Board of Directors apart with a sledge hammer. The Company didn't know it yet, but it didn't have a chance in hell of ever meeting another dividend.

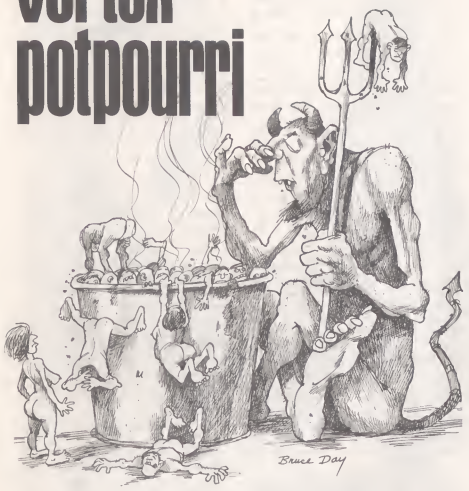
The only thing that had held us back so far was the shooting from the Consolidated people. Otherwise we would have blown Ceres into a billion fragments long ago.

I realized that I had been mumbling about these things; Stafford was looking at me strangely. I unclenched my fists and tried to get a grip.

"He'll need a bodyguard," the Colonel said. "Headquarters has been after me to assign someone to it, but I hadn't made up my mind yet." She looked speculatively at me.

turn to page 92

vertex potpourri



THE MONEY MACHINE

by Larry Eisenberg

He noticed the machine one day. More important, the machine noticed him. It was set in a niche on the street level of a forty seven story building made entirely of glass. The sign above the machine was a model of banality. It read simply, MONEY MACHINE.

Thereafter, he did not look at the machine but it continued to look at him. He heard it calling as he passed by. Unlike other machines, the sound was not vulgar or raucous but a soft, "Sir?". He pretended not to hear it.

One day it tripped him. He was not certain how or why but found himself sprawled on the sidewalk in front of the machine. He pulled himself slowly erect, conscious of a torn split at each knee of his trousers and two painful scrapes.

"Don't say it," said the machine. "I know you're angry and I don't blame you. But I had to make you listen to me."

"What do you want?" he asked through clenched teeth.

"I've seen you come by here day after day. You look different. You *are* different. I want to help you, to be of service to you. I want to give you some money."

"I don't need any."

There was a chuckle from inside the metal cabinet.

"Come on," said the machine. "Everybody needs it. And you need it more than most. Why are you so stubborn?"

"Sure I need it," he said. "And you're going to just give it away, aren't you? How much interest do you charge?"

"We're friends," said the machine. "There's a bond between us even deeper than blood relationships. Between us there is no interest, no carrying charges."

"Great," he said. "I always resented carrying charges. But what you can't seem to get into your megabit memory is that I don't want your god damned money."

As he walked away, he could swear that the machine had put together the oddest combination of sounds that almost perfectly simulated a sob.

"Now who in God's name would program a machine to do that?" he wondered.

He found himself passing the machine again and again. Each time it called to him but he did not answer. But inside he was pleased. And then, several months later, he found himself totally caught short. The holidays were over, bills had piled up and inflation was gloriously rampant. He thought of the machine and quickly shrugged off the idea. But the thought nagged at him until his resistance sagged. When he approached it, he had a pleasant smile on his face but he got no response at first.

Then it said, "When you need me, *then* you come around."

"It's strictly a business proposition," he said. "I need the money now."

The machine sighed.

"How much?"

"What's your limit?"

"The sky," said the machine and laughed.

"Two thousand dollars," he said. "I suppose you'll need my coded identocard."

"I know you and I trust you," said the machine.

"What about the payment schedule?"

"There isn't any, for you," said the machine. "And if you mention it again, you'll destroy our relationship."

"But I don't want a relationship," he said. "I want a businesslike deal where I borrow a sum of money, you deduct the interest in advance, and I pay you back periodically."

The machine said nothing. But in the lower left corner, a green lamp glowed. He opened the drawer and took out a fresh white envelope. Inside there were twenty, one hundred dollar bills.

"My God," said the machine incredulously. "He's counting it."

He had spent a thousand dollars before he became uneasy. There had been no deduction from the principal, no ar-

rangements for payment, no record of his identity code. What was the catch?

He went back to the machine the following week, flying cross country to do so. It greeted him warmly.

"How much this time?" it asked.

He drew a deep breath.

"Fifty thousand."

"Chicken feed," said the machine.

It was all there, in crisp thousand dollar bills. He wondered vaguely if they were marked. This time he said nothing about repayment schedules.

"Spend it in good health," said the machine.

He was sitting at a sidewalk cafe in the Piazza San Marco, idly studying the pigeons. The lovely girl at his table was bathing him in adoring glances that came over the edge of her wine glass. He toted up the figures in his head once again. Two millions, seven hundred thousand? No, seven hundred and fifty thousand. It was an enormous sum of money, more money than he ever would have dreamed possible and he had spent almost all of it.

The machine? His conscience had long since stopped bothering him about the hows and whys of the situation. The machine gave him without question, blindly, devotedly and he accepted in the same way. In fact, as he studied his billfold and noted the depletion of his store of lire, he realized that he would be jetting back that evening for more. He leaned over and took the wine glass away from his lovely companion and kissed her full on the mouth.

He was startled to find the machine was not there. He started into the arcade nearby to ask one of the storekeepers but then he decided it was not wise. He went back to its spot and saw the tiny smudge marks at the four corners of the rectangle where it had once stood. As he stared down at the floor, he was accosted by two men. His heart was in his mouth but he held on to his calm and insisted that they show proof of their statements. And he went with them calmly.

He was brought into a brightly lighted room. At first, he did not recognize the machine but it knew him and cried aloud, "I don't know him."

He was questioned very firmly. There was a battery of physiological monitoring equipment, hanging there suggestively.

"Of course," they said, "if you speak voluntarily, we won't have to use any of it."

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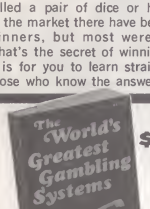
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"You'll need a court order to do it," he said. "Until then, I have nothing to say."

The machine was gallant to the very end. They searched every bit of its modest sized memory and there was nothing there to incriminate him. The instruction list had not been tampered with, the sorting machinery was in perfect order, even the white envelopes were neat and unsoiled. But the accounts were short.

He looked at the large table, where the dissected machine lay naked before him. His palms were damp and his breathing labored, but he managed to light a cigarette and puff it without a single tremor in his fingers.

"The court has refused our request to monitor you," they said. "We have no choice therefore but to let you go. But we know you were the one."

"You know nothing of the kind," he said.

As he left the room, a free man, he could see one of them sweeping the components of the machine into a waste bin. He went out into the street and took a deep breath of the twice filtered air. In his billfold was a return flight ticket to Rome and little else.

When he reached Rome, he took the train to Venice. She was in his room, waiting, her great gloriously brown eyes melting with adoration for him. When he told her that he was out of cash, she nodded amiably, gathered up her belongings, and flitted out the door like a wraith. He went into the bathroom and stared into the clear front surfaced mirror that was the pride of the hotel.

"What did it see in me?" he asked aloud.

Then he went down to the lobby and over to the front desk to tell the manager that he didn't have enough money to pay his bill.

UP YOUR TIME-SLOT

by Scott Edelstein

It was a typical, dull Sunday afternoon. George Berger turned on his aged black-and-white television set to watch the football game.

Instantly, a smiling face appeared, filling the screen. It had a long white beard and very long white hair and huge, dee-set eyes.

"Ah shit," George numbled. "Wrong station."

"No, my son," the face said in a booming voice. "You are tuned to the truest station of all."

George scratched his thigh. "Sorry, fella, but you're full of crap. I'm trying to get Howard Cosell."

The face beamed. "My son, you are the one who does not understand. You see, I am the Lord thy God."

"That's just what I mean," George said. "I didn't turn on the TV to see a religious show. I want to watch the football game. Unless they teamed you up with Howard Cosell, which would be a pretty lousy match."

God frowned for a moment, then resumed grinning. "But my son, of what importance is a football game when I can offer you Eternal Life?"

George reached out and changed the channel.

God lost his smile. "Listen here, son, you can't avoid me simply by changing the channel. Nor will I disappear if you turn off the television set, or even if you pull out the plug. Now, I didn't show up here for nothing. I want to talk to you."

George strode over to his desk telephone and picked up the Yellow Pages from a nearby table. "Okay," he said, his back to the television, "fire away."

"Well," God said, "it's basically like this; as things stand now, you're going to burn in Hell for Eternity."

"Really?" George inquired, dialing a number.

"For crying out loud!" God shouted. "Do you think I'm kidding? Look, pal, we both know you're Jewish as Moses himself. Unless you turn from your pagan ways and look to Jesus and me for guidance, you just don't have a chance."

"Hello?" George said into the phone. "Is this Jay Simpson, the TV repairman? Yeah, I got this problem. All I can get on every channel on my TV is God."

There was a snort at the other end of the line, followed by a muffled "goddam wiseass" and a distinct click.

"You see," God said, smiling broadly, "if you don't change your religious habits quickly, people will keep hanging up on you until the end of time."

Maybe I can report him to the FCC for broadcasting without a license, George thought, hanging up the phone.

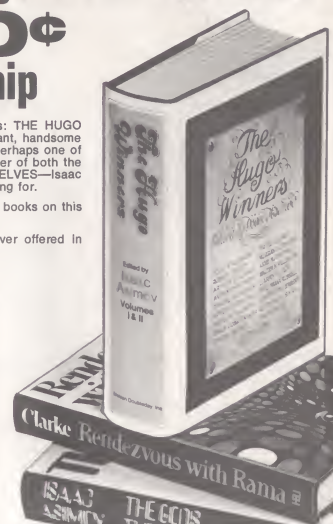
"Besides," God enthused, "think of all the benefits of heaven."

George walked into the den and slammed the door shut behind him.

"Wait a minute!" God screamed. "Come back here! I'm not finished. Whatever you do, don't turn on the television in there!"

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George collapsed in his easy chair and turned on the color TV with his remote control unit. The screen lit up a bright red immediately. He found himself looking at a dark-skinned man with horns coming out of his head.

"Dildoes," George grumbled. "Now it's the fucking devil."

"Yes, Mr. Berger, I am Satan," came a loud, deep voice from the speaker. "Adn I have a proposition for you. How would you like to be able to watch any football game you desire, anytime—and have your team win every game?"

"Don't sign anything without talking it over with me first!" God yelled from the other room.

"What was that?" Satan demanded, frowning deeply.

George sighed. "God. He's on TV in the next room."

"Go away, you fiend!" came God's muffled shout.

"Never!" Satan responded grimly, showing his teeth.

"I'll get you with a bolt of lightning in your unholy ass!"

"Wait a second!" George screamed, jumping up. "There'll be no rough-housing in my home. Unless you fellows can make up, you'll have to leave."

The devil's face darkened almost to jet black. "Come on, big holy man, I'll fight you in the alley right now!"

"Cursed be your name! You're on, you vile creature!"

Abruptly, the television screen went dark.

George breathed deeply and rubbed his yes. Wearily, he pressed the "on" button of the remote control unit.

The television screen lit up once again. George took one look at the image on the screen and dropped his head into his hands, defeated.

The game had been rained out.

READING THE METER

By Randall Garrett

There was an old gas-man named Peter
Who had trouble in reading the meter.
So he struck up a light
And was blown out of sight,
And, as anyone who knows anything
at all about the proper construction
of limericks can tell you, he also tore
hell out of the meter.

The United States, as everyone should know, is on the verge of converting completely to the Metric System of weights and measures, relegating the time-honored English System to the historical junk pile. No more ounces and pounds; we will use grams and kilograms. No more inches, feet, yards, and miles; we will have centimeters, meters, and kilometers. Pour the pints and quarts down the drain and fill up with liters.

Right now, the English are going through this sort of change but it's a change *we* went through nearly two centuries ago. The English are changing their money system. Until recently, the English monetary system had twelve pence to the shilling and twenty shillings to the pound, or two hundred and forty pence to the pound. How do you add 8 pounds, 11 shillings, fourpence to 6 pounds, 18 shillings, ninepence without going nuts?

Well, it's really no worse than adding 6 feet 7½ inches to 8 feet 8¼ inches, or adding 6 pounds 12 ounces to 3 pounds 8 ounces. It's multiplying and dividing that will drive you to the giggle farm. Ten times 11 shillings fourpence is 5 pounds, 13 shillings fourpence. The Metric System is far easier, since everything is multiplied or divided by ten. Ten times $1.35 is $13.50. All you have to do is shift the decimal point.

Mark, now, I don't argue that *using* the Metric System isn't easier than using the English System; it's the *conversion* that is going to have us sitting on the edge of our teeth.

During that time, all will be chaos.

Mr. Orville W. Tunafish, a skilled carpenter, needs a six-foot piece of two-by-four to finish the job he's working on. He drives to the local lumber yard, smiles at the clerk, and begins: "I want a piece of . . . "

Suddenly he stops, and a glazed look comes into his eye.

"Excuse me a minute," he says.

He goes over to a nearby table, sits down, takes out his English-Metric Metric-English Conversion tables and his Transistorized Electronic Calculator, and goes to work. After some time, he rises with a look of triumph in his eye, goes back to the dealer, and says: "I'd like a piece of finished white pine, 1.829652 meters long, 5.08001 centimeters by 10.16002 centimeters."

The clerk looks at him and shakes his head sadly. "We use actual dimensions now. You mean a 1.829652 meter piece of 3.98126 centimeters by 9.21006 centimeters."

"Sure," says Mr. Tunafish glumly. "Whatever."

On a farm just outside of Coffeeville, Kansas, Mr. Zebediah MacAroni wants his hired hand to go out and plow the back forty. After working furiously with pencil and paper, he says: "Hank, go out and plow the back 1618.7492 square meters." Psychologically, he's still not sure how big a square meter is.

Meanwhile, a housewife in Jersey City is ordering 453.5925 grams of butter and 946.333 milliliters of milk from her grocer.

And down at the liquor store Mr. Snuteful is buying a 0.75706 liters of gin, from which he will make martinis containing 59.1458 milliliters of gin and 6.5711 milliliters of dry vermouth.

But if all this isn't bad enough, look what it will do to the language! Old saws will have to be converted:

"28.348527 grams of prevention is worth 0.4534924 kilograms of cure."

"A miss is as good as 1.60935 kilometers."

"473.5925 milliliters is 453.5924 grams the world round."

And those little green caterpillars that hump their way placidly through life to the pupa stage will be called "2.54005 centimeter worms."

How far must we go in conversion?

Shakespeare?

"*Full 9.14402 meters thy father lies;*
"Of his bones are coral made. . ."

The Bible?

"*Hide not thy light under 35.238 liters.*"

How about the fairy story where the hero strides across the countryside in his 33.796 kilometer boots? How about fine old songs such as "*Roll Out the 136.2708 Liters!*" or "*Old Man Mose Has Kicked the 15.1412 Liters!*"?

The mind reels gently.

But when one thinks of the measurements that *could* be converted, it gets even worse. Most people know that horses are measured by *hands*—which is four inches. But there are other English measures: the *stone*, the *palm*, the *barleycorn*, the *firkin*, the *bucket*, the *butt*, the *slug*, the *scruple*, the *penny-weight*, the *rod*, the . . . (Gasp!) On and on. And every single one of them can be converted to the Metric System. And what does that give us?

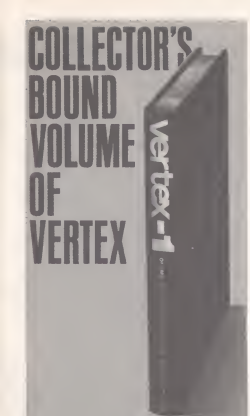
"A bird in the 10.160 centimeters is worth two in the bush."

"Cross my 7.62 centimeters with silver."

"He's always sticking his 30.48006 centimeters in his mouth."

"Get off your 0.57281 cubic meters and go to work!"

I can see a time when the Women's Christian Temperance Union, having patriotically converted to the Metric



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System, will continue to be vociferous in their denunciations of the evils of the wicked John 8.4667 Millimeters. I predict that those who are violently opposed to artificial insemination will have as their motto: "Spare the 5.02921 meters and spoil the child!"

All our scruples will weigh in at 1.2959784 grams each, and a slug of whiskey will weigh 14.594 kilograms. It will be said of a strict teetotaler that he is always "cold, 6.350 kilograms sober."

At this point in time and space, it is impossible to predict how far this conversion process will go, but there are certain consolations.

After it's all over, a man can walk up to a pretty girl and ask, "How would you like a good 34.068 liters?"

And she will know exactly what he means.

TIME AND VARIANCE

by Buddy Saunders, Steven Utley and Howard Waldrop

It was the third night of the first day, and *everybody* came unstuck in Time.

So Alexander the Great did not know beans about invading Poland with Stukas and *panzers*, and the *Enola Gay* wiped out the Spanish Armada the evening before the English were to have done so, and Vikings overtook the *Mayflower* and did in some very surprised Pilgrims, and Frank Luke, Jr., was the one who got the *Hindenberg*, and Jack Pershing found himself on a Wyoming Territory knoll looking down upon several thousand decidedly irate Sioux and Cheyenne warriors who were busy with the extermination of a couple of hundred decidedly confused cavalrymen, and Sam Clemens abruptly realized that he was writing something entitled *Catch-22* while Joseph Heller tried to figure out how he had suddenly come to be writing *Thuvia, Maid of Mars*, and Jack the Ripper gut-knifed Mary Pickford in an alley in Pompei, and Lyndon Baines Johnson beat Thomas E. Dewey in a landslide, and Lee Harvey Oswald mowed down Queen Elizabeth I, and Genghis Khan's hordes rolled over the Woodstock Pop Festival, and a banzai charge rolled over a line of National Guardsmen at Kent State University, and a tear-gas grenade intended for a clump of Berkeley dissenters rolled to a stop beneath the scaffold on which an astounded Torquemada was about to go under the guillotine blade intended for



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Louis XV, and Benjamin Franklin found himself editing a magazine called *Planet Stories*, and the *Monitor* blew Cleopatra's barge out of the water, and Amelia Earhart splashed down in place of the expected Apollo capsule, and the *Titanic* missed its iceberg but accidentally rammed the *Bismarck*, and even Kurt Vonnegut, Jr., ended up someplace, somewhenever, other than where he was supposed to be.

Then everybody changed places.

So the Poles did not know beans about invading Alexander the Great with Stukas and *panzers*, and to complete this paragraph, please hold paragraph two up to a mirror. It worked for Leonardo.

"Can you top that?" projected Kxdghbv, smiling green smoke.

Xggec scratched his oldest eye and yawned through the northernmost of his auditory orifices. He took the jumblizer and positioned himself before the storyboard. "Pass the cookies and ilk, Kxd, and I'll try."

The Martian war machines arrived amid confusion and panic. The Italian Navy moved to intercept the tripods on the Great Salt Lake in Utah but lost five ships in a brief exchange of heat rays and shells. The second Terran defeat came at Hopechest, Maine, where other Martians took on the Swiss, this time losing one of their tripods in the action.

Elsewhere, the Venerians were held temporarily at bay by Spurs Jackson and his Space Vigilantes, but a critical panel had been deliberately omitted. Spurs tumbled away into the abyss, clinging desperately to a hastily mouthed obscene word balloon.

Laser met musket. Missile met morningstar. Sword met submachinegun. Ultimate weapon met answer to ultimate weapon. Alien anti-matter masher met Terran ingenuity.

All shook hands and turned on their sentient masters, human and alien alike.

Xggec beamed with satisfaction, inadvertantly blistering the ceiling. "You'll note that it was all done while I held my breath and ilk."

"You might have asked me to hold them for you," complained Dfcxechy, who was in fact Kxdghbv of a (incommunicable term) before. The Vvvvv are in the habit of changing their names as well as their sex, though one less often than the other.

Xggec passed the jumblizer to Dfcxechy. "Your turn."

The launch slid into the quiet cartoon waters. The sailor sang:

"A duck was captain of the ship,
He wore a jacket on his back.
When the ship began to move,
The captain said, 'Quack quack!'"

Xggec arched several eyebrows.

"Just let me finish, just let me finish," said Dfcxechy, bending lower over the storyboard.

Garbage cans abruptly retched their contents into the streets. Telephone poles shook themselves violently, loosing spaghetti strands into the bright sunlight, and screamed "Use tin cans and twine from now on!" Cars coughed and choked and cried out, "This gas shit is killing us!" Sewers omitted the word gas. Fires crept back into the wood, oil, gas, coal, saying, "Brrr, it's *cold* out there. Let's stay inside where it's nice and warm."

Everything quit, entropy taking over, heat, light, all, fleeing to the farthest corner of the Cosmos to huddle and look over shoulders and watch the Earth run down.

People wondered, in those last few seconds, why it was getting so dark and cold and tired and flat and soft and icky everywhere.

Soon, even the cartoon sailor had become part of the humming void.

"Touching," said Ghomskfp, who had been Xggec not long before. "However, the significance of the sailor eludes me. But I tire. Top this, or concede."

The sky was blue and the sun was bright.

The little girl picked up the pretty cat, hugged it to her for a moment and then beat its head against a tree.

"Bad puddy tat," she said.

"You cheated," said Dfcxechy.

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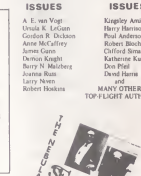
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COLLATERAL

by F. M. BUSBY

Hey, Leon–long time! C'mere, man; shake. Haven't seen you since–

This here? Prosthetic arm, you're shaking. What else?

Oh, a couple of years, I guess. Let's see; I borrowed for my new sleep booth right after I paid off my transit-pass

turn to page 98



We've had the SUPERSTARS! Poul Anderson / Piers Anthony / Richard Ashby / Dr. Gregory Benford / Ray Bradbury / John Brunner / Ed Bryant / F.M. Busby / Terry Carr / Philip K. Dick / Scott Edelstein / Larry Eisenberg / Harlan Ellison / Roberto Fuentes / Stephen Goldin / James Gunn / Harry Harrison / Robert Heinlein / Frank Herbert / Walt Liebscher / George R. R. Martin / Larry Niven / Rachel Cosgrove Payes / Dr. Jerry Pournelle / William Rotsler / Joanna Russ / Neil Shapiro / Robert Silverberg / Norman Spinrad / James Sutherland / A. E. Van Vogt / and Ted White / **So guess who's coming next in VERTEX!**

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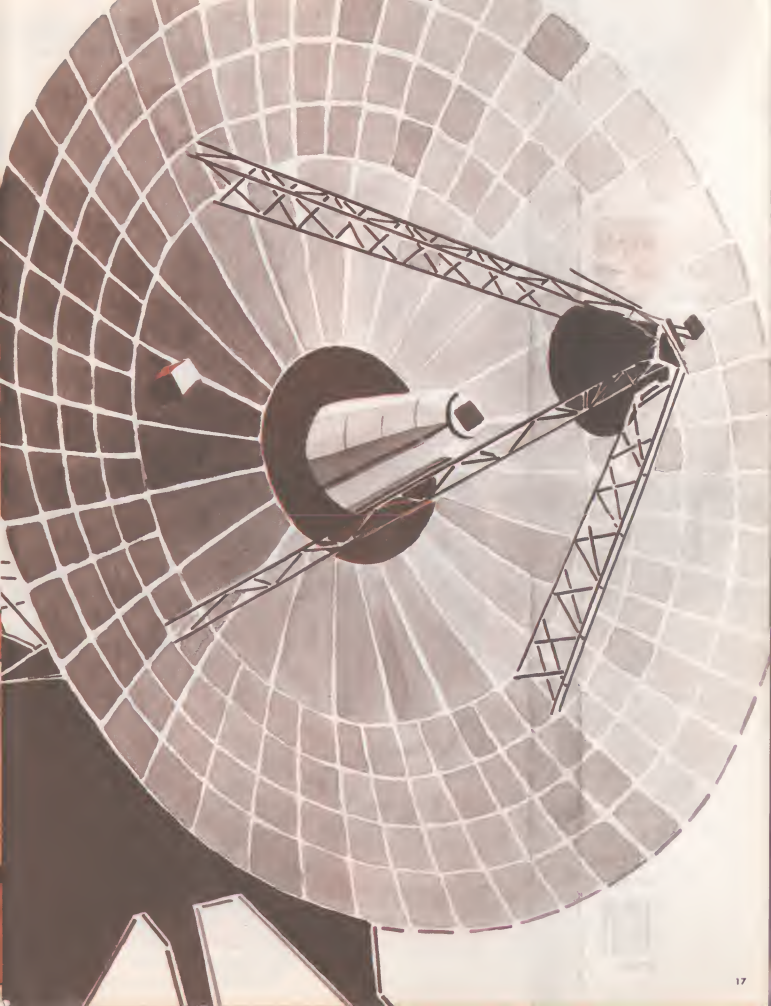
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Mankind had much to offer HR 8832, but who was to decide just what would, or would not, be given.

DECISION AT 21 CENTIMETERS

fiction/NEIL SHAPIRO . . . artist/STEVAN ARNOLD



The Home Run signal told man more than that he wasn't alone in the universe. It told him that he still had a long way to go before being completely civilized.



The demonstrators were a shouting mass of bodies and picket signs clustered just outside the massive gates of the Project. The two guard houses on either side of the huge, wrought-iron gates were quiet, although I could see shadowy figures just within the barred windows each time that the chanting crowd moved from my line of sight.

Beyond and behind the anonymous white buildings of the Project, surrounded by carefully landscaped lawns, was the giant, hemispherical shape of the Project's main and primary antenna. The sunlight, coming now from low in the west, served to accentuate the almost surreal shadow which the radio telescope/transceiver cast onto the evenly manicured grounds.

It was a windy, autumn day. Dead leaves blew all around me, carried by erring winds from off neatly raked piles. The colorful leaves cracked softly as they were wind blown against myself and the side of my car. Briefly irritated, I brushed at them futilely.

From my vantage point of the parking lot, which stood on a hill an eighth of a mile from the gates, the clamorous crowd seemed ridiculous in their somber clothing. Their grays and fatigue greens formed a small lake of olive-colored waters lapping against the bright and clean borders of the Project. The pinkness of their shaven heads, bobbing up

and down on the olive sea of drab clothing, only added to their ludicrousness.

A car, one of the small floater vehicles, drew up on the other side of the gates. The guardhouses relectantly divulged their contents. A dozen police dressed in the silver and red of the United Nations began to compress the edges of the crowd back away from the blacktopped driveway which snaked its way from the midst of the Project buildings, through the gate, and to the parking lot where I waited.

The crowd was restless. Their numbers had increaded rather than diminished throughout the course of the day.

The crowd, sluggishly and resentfully, moved back. The gates were opened. The small auto, a bright blob of color, floated towards me along the macadam surface. I smiled and waved to the driver, my fiancee Laura Von Hecker.

In a few more seconds the floater pulled up beside me. I forgot all about the somber demonstrators, I even forgot my New York editors. Laura and I busied ourselves with what you might expect two lovers to occupy themselves with after a long two months of separation.

"And how has your father been?" I finally got around to asking. Her mood darkened and her smile faded.

"Upset," she answered with a troubled look in her eyes, "and angry."

"Is it true then that he resents the UN? That he doesn't go along with the establishment of UNACC?" As soon as I had asked I realized that I shouldn't have.

"Looking for a story, Matt?" Laura pushed away from me.

"Of course not, at least not now. My editors would appreciate an interview or two with Dr. Von Hecker but right now I'm just interested in the illustrious man's daughter."

She mellowed a bit at my words but I still sensed a breath of winter between us as I followed her into the floater car. The car lifted. It did so a bit jerkily, as if one of its jets might have been slightly off of adjustment, then the vibrations smoothed as we travelled silently a few inches off the pavement in the direction of the Project gates. Laura was in no mood for further conversation. After my earlier *faux pas,* I respected her wishes. I realized what her father must have been going through and I knew how she felt about anything affecting his work. For that matter, I knew that with the exception of a small minority most of the world felt the same.

As we drew closer to the gates I became more aware of certain members of that minority. It was hard to tell anything about the individuals in the crowd. Not only did the drab clothes they all wore make it difficult to determine ages but their shaved heads also were a confusing factor. The unvarying cut of the olive drab tunics, the pinkness of the shaven pates, both also contributed to an aura of sexlessness that made the presence of the crowd more oppressive than just their numbers alone could account for.

Their picket signs were the usual mixture of slogans and demands. The largest sign, more a banner, was held aloft by five of the demonstrators. It read simply:

DON'T SHARE THE BOMB!

The smaller signs ranged from the argumentative, to the demanding, to the absurd, to the quasi-religious. I had to laugh as I saw one sign that bobbed up and down. *Prometheous Suffered For His Sin,* it read. Another one was a short quotation, *"A Sin Shared Is A Sin Twice Committed."* The quote wasn't attributed but I recognized it as having originated with the so-called Maha who had been born Jacob Desmond and had but a year ago founded the Church of the Eastern Light.

Laura glanced over at me as she drove. It was easy to tell that she saw no humor in the signs.

We came to the fringes of the crowd. The floater didn't even slow and, for a terrible second, I thought that Laura meant to drive directly into the massed bodies of the Eastern Lighters. I feared not so much for them as for Laura and myself. The low mass floater would probably only bruise whoever it hit. But its delicate balance would likely be upset and Laura would lose control of the car. Unstabilized, the floater could tip right over and give us a bad dumping.

But at the last minute, she braked the car. We stopped no more than a foot from the people on the very fringe of the crowd. Laura leaned on the horn. I was surprised to see the wetness of tears, held back at the corners of her eyes.

The demonstrators pressed around all sides of our car. They shouted but the vehicle's soundproofing prevented me from understanding their words. But there was no doubt that the crowd was in an ugly mood.

One of the Eastern Lighters, a young girl who was probably no more than sixteen, spat viciously on our windshield. Others began to rock the floater back and forth on the unstable axis of its air-treading jets. Laura kept up her pressure on the horn. By then I shared her emotions. I had absolutely no wish to be a passenger in a dumped floater.

Finally, the red and silver uniforms of the UN cops broke through the drab-olive of the Eastern Light. About a dozen officers began to move the crowd away from the car. I saw one of the police grab the girl who had spat on our windshield by her arm. He twisted it behind her and literally threw her off the driveway. One of the other Lighters jumped on the UN officer from behind. But a second UN cop decked the demonstrator with a tranquilizing needle shot from the tip of a riot club. It was from such close range that I wondered whether it was the force of the needle or whether it was the drug which the needle carried that caused the Eastern Lighter's lapse of consciousness.

Only a few demonstrators continued to block our way. One of them suddenly slapped a large, self-adhesive handbill against the car's windshield. The printing, on the same side as the adhesive, read, "One Man's Poison is Another Man's Death."

The driveway was at last cleared and the Project gates opened. We drove through, Laura peering around the edges of the adhering handbill. I heard the gates clang shut behind us.

"You've been assigned a room," Laura said, "in the Bachelor Scientists' Quarters."

"Thanks, I appreciate it." I did, too. I knew that she and her father must have pulled the proverbial strings to get me bunk space near the action rather than off to the side in the Press and Media Building.

"Can you stop the car for a second?" I asked. I motioned to the handbill which was still plastered to the car's windshield. "After you've read this a dozen times or so it tends to lose all meaning."

"Sure, Matt." She pulled the floater off to the side of the road. "But I don't personally think," she added, "that it held that much meaning on the first reading."

I climbed out of the floater and ripped the handbill off the glass. The adhesive stripped off of the back in a few spots but at least we were then able to see out of the car. I wadded up the paper and jammed it into my pocket, not wanting to litter the carefully kept up grounds. I got back into the car.

"Thanks, Matt." Laura smiled and I realized that our earlier mood could be recaptured. "I am sorry but I've been so on edge lately. The demonstrations, UNACC. Sometimes I feel that everything is just falling to pieces."

The decision was Earth's, but circumstances determined that it was one man's to make.

We had arrived at the bachelor scientists' quarters and Laura stopped the car.

"See you later," I asked, "after dinner?"

"Of course," she laughed. "You won't be able to escape me if you try. But here, take these." She handed me a sheaf of credentials. "Without them they probably wouldn't even let you into the lobby. Security is a lot more stringent these days."

We decided on a definite time to meet later that evening. I left the car and entered the dormitory building. The first thing I noticed was a guard who hadn't been there two months ago. There was a sign on the wall behind him. The sign read, "No Admittance to Unauthorized Personnel" and was signed by the United Nations Alien Contact Commission (UNACC). I didn't recall the sign. It must have come in at the same time as the guard.

I handed the thick stack of credentials to the unsmiling guard. He rifled through them slowly and seemed satisfied that they were in whatever order was necessary.

"Second elevator," he said in an official, bored monotone, "to the fourth floor, suite 412."

The suite contained two bedrooms, a living room and a small kitchen. I glanced in at the first bedroom door and saw that whoever my roommate was, he was presently out. I made myself at home in the second bedroom where I discovered that my luggage had not only arrived but had been unpacked for me. My clothes had all been either neatly hung up in the spacious closet, or folded away in the drawers of the bureau. It occurred to me to wonder if my belongings had been searched, not that anything unusual would have been found.

I took my shoes off and gratefully stretched out on the full-size bed. It had been a long day, and a long flight from the Coast.

Then I heard the main door open and close, then a voice called. It was another voice I hadn't heard since two months ago when I had left the Project to be a temporary war correspondent.

"Matt? You in there?"

"Felix!" I answered, "In here."

Dr. Felix Rice entered the room. He took one look at me and burst out laughing, saying, "Collapsed already, huh? Glad to see you kept your health." He grabbed at my arm and pulled me bodily off of the bed to my feet. Then he pummeled my shoulder with an oversized fist.

"Please," I said, "I'm an old man. What are you doing here anyway? No one else will be your roommate?"

"Sure," he replied, "but all the volunteers are stuck on the fifth floor." The fifth, I remembered, was where the women scientists bunked. "Anyway, if not for me you probably would have wound up with some skinny, ascetic type like Malloy in Physics. Who would you drink with then? Drink?" His face lit from within, "Did someone mention a drink?"

He disappeared into the kitchen and momentarily returned carrying two frosty glasses.

"Poured these a while back and kept them in the fridge. Always ready in a pinch. Think you'll like this."

I took the proferred glass of golden liquid. It tasted somewhat like a cross between brandy and one of the honeyed liquors. It wasn't sweet, it wasn't harsh. I still don't know where Felix found those drinks of his.

Felix and I had been together through four years of State U., though he had gone a bit further than myself even having continued for a while after I left.

Felix Rice M.D., Ph.D. in Biochemistry, M.S. in Physics. He had been the best wrestler that our college Varsity team had ever seen, or was likely too again.

"Well," I said, making a toast out of it, "once a roommate always a roommate." We both drained our glasses. The liquor left a golden aftertaste.

"How have you been?" he asked, now serious.

"Oh, pretty good. But you were right," I thought back on the last two months. They had been spent in a jungle on the other side of the world as I reported on a UN Police Action for my readers safe at home. All in all, it had been the lowest ebb of my journalistic career—personally speaking if not professionally so. "It wasn't any fun at all," I concluded.

"Didn't think it would be," Felix said soberly, "but what the Hell? You're back."

"Sure am," I said, thinking of all the others I knew of who would never make that claim. I placed the empty glass carefully down on the bedside table and resumed my earlier, prone position.

"How come," I asked, "you don't rate a private room? I've heard rumors that your team has made the most progress so far in translating the Home Run signal."

"Please," Felix winced, "that name. The sun of the planet in question is cataloged as HR 8832. HR stands for Harvard Research. Home Run is a painful vernacularization."

"And I'm a pretty painful newspaperman," I replied. "Besides, if the Homers don't like what we call them, they'll let us know."

"They might," Felix said reservedly, "providing that we do hear from them again."

"Why wouldn't we?" I asked, my curiosity now fully aroused.

"Well, if we don't answer their first signal to us," Felix replied, "they won't be sending anything else our way."

"No danger of that is there?" I wondered what, if anything, he was leading up to.

"I just don't know." The big man's voice was small and unsure. The uncertain emotion he displayed was a feeling that I had never known him to express before.

Before I could question him further he stood up and, jocular once again, said, "Looks to me as if you need your sleep. A beauty rest sure wouldn't hurt any. Anyway, I have a conference to waddle off to. Three hours or so of confusion and argument, such fun. But I'll be back in time to wake you for dinner."

He left, turning out the light and closing the bedroom door behind him. The combination of the long plane ride, the disturbance at the gate, and Felix's gold liquor caused me to almost immediately fall into a deep, dreamless sleep.

Felix's conference must have lasted much longer than he had thought it would. It was well past the dinner hour when I finally did awaken to find myself with less than an hour before Laura's arrival.

I shaved, showered and made myself as presentable as is possible for one not possessed of a great deal of handsomeness. Then, luckily for my starved inner man, I found some coldcuts in the small kitchen refrigerator and was able to eat a moderate dinner after all.

Laura arrived right on time. We decided to drive around the Project grounds and talk over old times. Old times were but nine or ten weeks gone, but separation had given an edge to those weeks.

As I knew we would, we wound up parked under the dark form of the huge primary antenna. Its hemispherical dish pointed to the stars in general and to HR 8832 in particular. The antenna was a fascinating object. There was something about its dish-shaped bowl which was eighty meters across, the criss-crossing girders that composed it and held it up, the jumbled metal of the

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The author of the controversial "Chariots of the Gods" tells Vertex why he believes man was visited from the stars in the far past.



VERTEX INTERVIEWS ERICH VON DANIKEN

interviewer/RICHARD T. CROWE

VERTEX: Erich, how did you first get interested in researching ancient astronauts?
VON DANIKEN: I had a very Catholic background and I had my doubts in religion and I could not believe any more in Christianity. I asked my professor what to do and he said, "first understand the Old Testament, because the Old Testament is the base for the New." I started to read Moses and I realized that Moses speaks in the plural in the beginning: "Let *us* make man in *our* own image;" going on, Moses 6: "and the *sons* of the *gods*." Which sons of which gods? What is he talking about now?

So I had more doubts than before. I then tried to find out what other communities said about God in the beginning of time. For example, what is the first mention of God in Sumerian texts, or in Red Indian texts, or in Hindu texts? And I realized that they all speak in the plural, not one singular. I then asked the professors of philology what was the meaning in antiquity of "the gods" and they found out that, going back to Hebrew or the Aramaic, the meaning was "those who turn in the clouds." *Who* turned in the clouds?
VERTEX: Did you begin your research program on your own or did any particular author influence your ideas?
VON DANIKEN: I read on my own, but I was a fan of science fiction.
VERTEX: Is there any one piece of archaeological evidence that particularly convinced you?
VON DANIKEN: That stone of Palenque. As soon as I saw that figure—and I know the archaeological explanations—I was just laughing.
VERTEX: What is the most convincing piece of archaeological evidence you would offer a skeptic?
VON DANIKEN: I would again say the stone of Palenque. And also the archaeological evidence of the cave painting in the Tassili Mountains. There we have one of the paintings looking exactly like an astronaut. He has bindings on, and a helmet, and the padding around his neck. I don't see any other explanation for this.
VERTEX: When do you think the first extraterrestrial contact took place?
VON DANIKEN: The first contact must have been in the very deep past of mankind. I would say it must be between 25,000 and 40,000 B.C., because that's the only possible time they could have made an artificial mutation. Later it's impossible.
VERTEX: Is this mutation possibly the story of Adam and his rib?
VON DANIKEN: Yes.
VERTEX: What was man's condition when the first contact took place?
VON DANIKEN: They had primitive tools, but they had no knowledge in, let's say—art. In making cave paintings or things like that. They had nothing like friendship.
VERTEX: Do you think that we will ever discover the physical remains of any extraterrestrial?
VON DANIKEN: No, because they took their remains back home with them.
VERTEX: Have you determined any of the physical characteristics of the extraterrestials?
VON DANIKEN: We have pictures from antiquity and some statues about 30,000 years old, and they all show the gods with very big eyes. The eyes are bigger than ours, in a way like insects. The nose is very small and has two big holes. The ears are pointed.
VERTEX: How many extraterrestial contacts were made?
VON DANIKEN: I think there were two or maybe three contacts. For sure, two. It's very hard to differentiate the mythologies because you always find similar things in other old books. For example, we have Ezekiel the Prophet. He makes his description in 592 B.C. After Ezekiel we should be sure that 592 B.C. was a landing. But so many times in antiquity someone has copied from another, so we are—dammit—never sure. I would say all those mythologies and all those speaking about gods coming from heaven and so forth have all the same origin—there was in antiquity only one visit.

I think we had two visits. The one was 25,000 to 40,000 B.C. when the gods realized that man had again had sexual contact with the apes, which were the real forefathers. The number of their chromosomes was the same at that time. Then they decided to kill everyone and just leave a small group.
VERTEX: Then the original contact must have been in the cradle of mankind where all peoples and races originated?
VON DANIKEN: That's my idea. Races, I don't know. Maybe the races are the products of those genetic experiments.
VERTEX: Do you have any idea where this contact took place?
VON DANIKEN: Here again we have troubles. Usually we believe that it was the Middle East, but I'm not so sure. I have heard that in China, in the Gobi Desert, there are large subterranean towns and technological things.

On the other hand, if you read *Gilgamesh*, for example—Gilgamesh who is the survivor of the Great Flood and he speaks in the first person—he says, for example, that he looks for the "park" of the gods. And he finds the "park" of the gods on a high mountain. And he says: "I had to pass the sun-door," which could be Tiahuanaco. And he says that the gods told him to cross the ocean, so it could be that it was in South America. We are never sure.
VERTEX: What is your typical workday?
VON DANIKEN: I sit in my room where my TV is and drink champagne, quite alone. I think and I dream.
VERTEX: Are there any other researchers in this field that you think are doing especially valuable work?
VON DANIKEN: The best thing I have read in this direction is by the two Frenchmen, Pauwels and Bergier, *The Morning of the Magicians*. Then we have the Frenchman Robert Charroux. He has good facts.
VERTEX: Did you have any trouble getting a publisher at first?
VON DANIKEN: Nobody wanted to have my book. Nobody. It was fantastic. I sent the manuscript to

von Daniken sees the Mayan temple carving as an astronaut in a couch inside a space capsule with a control panel above him and a rocket engine below.



about twenty publishers. Everyone sent it back. I would not have found a publisher if a newspaperman had not helped me.

VERTEX: Do you think your reception in America was better?

VON DANIKEN: Yes, but only after the book was a success.

VERTEX: Where did *Chariots of the Gods?* first catch on?

VON DANIKEN: In Switzerland. We have a big Swiss newspaper, a weekly called "Weltwoche," and this newspaper serialized my book before it was on sale. And so the first 6000 copies from Germany were sold in Switzerland before the book was on the market, because of the newspaper. That's how the whole thing started.

VERTEX: Where do you think we are likely to find new evidence for your theories?

VON DANIKEN: I would love to go to Red China and be completely free to look around. It's very hard to do though with the political thing. But I have a feeling that there is a lot of material in those vast deserts they have, or in the mountains.

VERTEX: What approach do you feel archaeologists should take in the future?

VON DANIKEN: They should work together with other disciplines. They should not only work with their own knowledge. An archaeologist has been trained in an archaeological school and he has been trained with archaeological books and he will always look in his own direction. He will never look in a technological direction. Archaeologists could work, for example, with engineers or with chemists, not only for finding out datings, but to find out, "could this painting be a formula?" Or what could it be? Just look at artifacts with modern eyes.

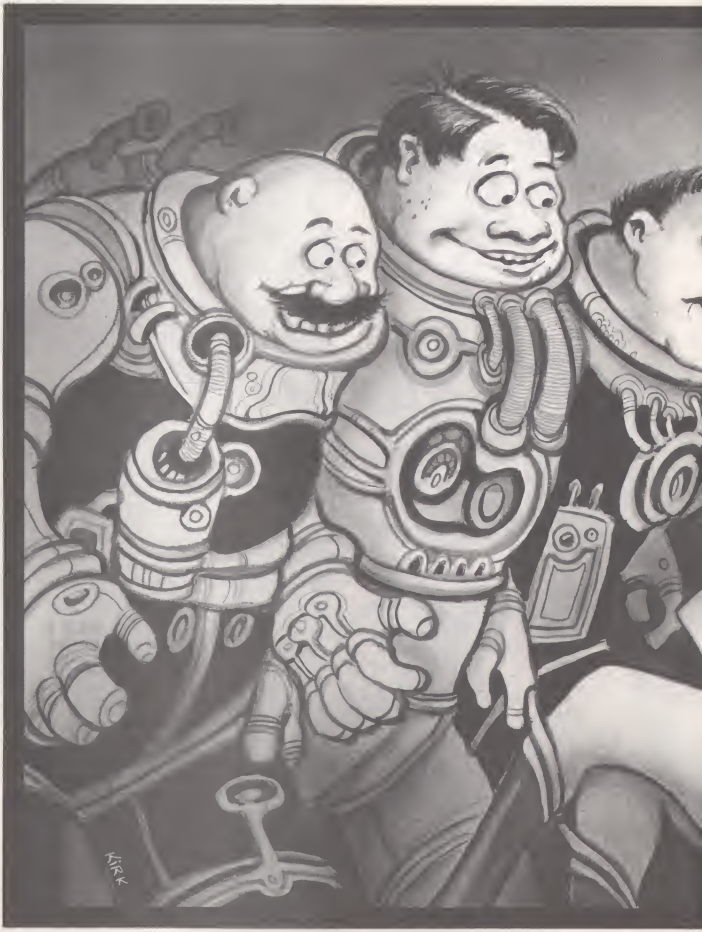
VERTEX: Will the ancient astronaut trend continue?

VON DANIKEN: It will come to everyone's mind within the next generation. It will be a normal thing. Newspapers will have headlines on it.

VERTEX: Will acceptance of your theories be due to a mass of accumulated evidence or a spectacular discovery?

VON DANIKEN: Both. We will have a mass of evidence and we will have a spectacular discovery. I have a feeling that those visitors from outer space did not leave our planet without depositing definite proof. There must

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KIRK



Vertex presents something a little different. A three act play for the space age, which will probably set science fiction back at least fifteen years.

a play in three acts / JOE HALDEMAN
artist / TIM KIRK

THE MOON AND MARCEK

ACT I

MARCEK *is sitting with* **WISE MARTHA** *in a bar on the moon. A moonscape is visible through a thick window over the bar, and things fall very slowly when dropped.*

MARCEK [*slumped over drink, head in hands*]: I don't deserve to live, Wise Martha.
WISE MARTHA [*rests a hand on his shoulder*]: Come on now, Marcek. That's boozer talk. I know you—
MARCEK [*knocks hand away*]: You don't know me [*hiccoughs*]. You don't know nothin' 'cept how . . . how to do it. Fif'y–sixty diff'rent ways.

WISE MARTHA: Well!
MARCEK [*leers*]: Well?
WISE MARTHA: Listen, spacer. I'm just as much a professional as you are. Fifty, sixty ways, indeed!
MARCEK [*chastened*]: Sorry. Didn't mean—
WISE MARTHA: Look, I've got a certificate [*fumbles in purse*]. Where the heck is it . . . to get certified you have to master all of the Kama Sutra—and make up more besides! Here! [*hands certificate to* Marcek]
MARCEK [*waves paper away*]: I believe you, Wise Martha. Please, don't get massive with me. Not this day, of all days.
WISE MARTHA: Well, you got my dander up. [*Warms.*] Something's eating you, Marcek. A girl can tell.
MARCEK: Ain't nothin'.
WISE MARTHA: I know better.
MARCEK [*sobering*]: I guess they don't call you Wise Martha for nothing.
WISE MARTHA: Betcher bum they don't!
MARCEK: They're taking my torcher's license away.
WISE MARTHA: What? You aren't forty yet!
MARCEK: Thirty-five. But my liver's shot.
WISE MARTHA [*nods*]: Moon'll do that to you . . . no ride back?
MARCEK: Not unless I can scare up passenger fare. Comes to one billion, three hundred and forty-eight million and some, including tax.
WISE MARTHA: You don't have it?
MARCEK [*shrugs*]: Who can save money around here?
WISE MARTHA [*caresses him*]: Poor thing. Stuck on the moon.
MARCEK: I don't know how to handle it.
WISE MARTHA [*suddenly businesslike*]: You need something to take your mind off your troubles. Ever try my "Position of the Sparrow"?
MARCEK: I'm not sure; they all blur together in my memory—[*quickly*] 'cause they're all so good! But heck, Wise Martha, I've got to watch my money.
WISE MARTIIA [*expansive gesture*]: On the house, this once. My place or yours?
MARCEK: Yours. I don't have a place any more.
WISE MARTHA: All right. [*Removes checkered tablecloth from table in front of bar, folds it neatly for use as pillow. Pulls rip-cord on her costume and climbs voluptuously naked onto the table*] Ready any time you are.

As lights fade, they execute position of the sparrow while BARTENDER *discreetly polishes glassware, sneaking occasional look and whistling.*

A little while later, same bar. **MARCEK** *is leaning limply against the bar while* **WISE MARTHA** *straightens tablecloth, humming.*

MARCEK: How 'bout a beer, bartender.
WISE MARTHA *hums* very loudly.
MARCEK: Make that two.
WISE MARTHA: Gentleman to the core.
BARTENDER [*places two bottles, glasses, coasters in front of* MARCEK]: That'll be eight hundred.
MARCEK [*dumps a pile of coins and wadded-up bills on the bar, counts out eight coins*]: There you go.
BARTENDER [*not without sympathy*]: Hard times, eh?
MARCEK: The hardest. [*takes beers to table—a glass under each arm—and sits with* WISE MARTHA]

Airlock door STAGE LEFT *opens explosively. Drop air pressure in theatre sufficiently to make audience's ears pop.* MARCEK *is caught in process of sitting, two bottles in one hand, fistful of money and coasters in the other, a glass under each arm, staring as* MANNY, MOE *and* JACK *enter in a graceful twenty-meter broadjump.*]
WISE MARTHA: Hey—Manny, Moe!
MANNY, MOE [*in chorus*]: Hi, Wise Martha.
MARCEK: Who's the new guy?
MANNY: That's Jack.
MARCEK: What the hell kind of a name is that for a spacer?
MOE: Ain't his real name.
MANNY: His real name's Marcelle.
JACK: Will you guys cut that out?
MOE [*offers* MARCEK *nasal inhaler*]: Krrf?
MARCEK: Wish I could. Busted liver.
MOE: That's life. [*to* BARTENDER] Three double tequila sours.
WISE MARTHA: Marcek just got busted.
MANNY: Yeah, that's what he said.
WISE MARTHA: Not just the liver. *License* busted!

Bring air pressure in theatre back up to normal; basso theramin chord. MANNY, MOE *and* JACK *stare at* MARCEK,

MARCEK: Yeah, that's right. Grounded. Luna-ed.
MOE: You have enough for a ticket back?
MARCEK: Nope, I'm about 700 million short. Any of you guys got that much to loan? Together, maybe?
[*All babbling at the same time*] **MANNY:** Heck, I don't have half that much in the bank. **MOE:** I've got two wives and eight kids to take care of. **JACK:** I ain't worked but three days.
BARTENDER [*setting down sours*]: There ain't but one person on Luna could loan you that kinda money.

Everybody turns slowly to stare at WISE MARTHA.
WISE MARTHA [*fidgetting*]: Aw . . . come on, fellas. I don't really have . . .

Airlock door swings open again, this time with no fanfare. A spacesuited figure minces in, then doffs suit to reveal herself as MERRY MARY, *clad in one large towel.*

BARTENDER: Maybe two.
MARY [*musically*]: I was in the bath but I saw you boys come in. I didn't know *you* were here, Wise Martha.
WISE MARTHA: The more the merrier [*feral smile*].
MANNY: Say, Merry Mary, we have a real emergency. You wouldn't have a couple hundred M's to loan out, wouldja?
MERRY MARY [*turns to fish through hanging spacesuit, carefully letting towel slip in back. Finds bankbook.*]: Sorry, boys. Just sent five hundred to my poor Mom, Earthside. [*pouts, holding out bankbook.*] See, I don't have very much at all. [*towel slips more.*]
WISE MARTHA: Poor thing. [*turns to* MARCEK] See how little she has.
MERRY MARY: What's the emergency?
MARCEK: Ah, the Company pulled the cirrhosis clause and grounded me. I've only got like 650 M's. Need more than twice that much for a ticket back.
MERRY MARY [*genuinely*]: Oh my.
MOE: And hell, he couldn't live here two months on that.
MERRY MARY: Don't *I* know it! I can't even afford to buy new clothes.
WISE MARTHA [*aside*]: She wears out two towels a week, poor little chickadee.
MARCEK [*hollowly*]: I'll be the first person in history to starve to death on the moon.
MOE: Hell, we'll slip ya some grub.
MARCEK: And after the first of the month I'll have to live outside of the dome.
WISE MARTHA [*slowly*]: I have an idea. That is, if Merry Mary has the stamina for it. [**MERRY MARY** *flexes*

With the company against him, Marcek had no way home from the moon. But once Wise Martha agreed to help, he was on his way.

body] Bartender! L-dopa all around.

BARTENDER *passes around vial of pills.*

WISE MARTHA [*enthusiastically, with rah-rah gestures*]*:* We give our *all* to Manny, Moe and Jack! The whole repertoire!

MANNY, MOE AND JACK: Yeah yeah hey hey sounds good I'm game.

WISE MARTHA: But we charge Union rates.

MANNY: Have a heart, Wise Martha.

MOE: Hell, I got two wives and eight kids . . .

JACK: Awww . . .

WISE MARTHA: But wait! Half the money goes to the Maxwell Marcek Relief Fund!

MANNY, MOE AND JACK: Hot damn golly by Jeez they don't call you Wise Martha for nothin'!

MERRY MARY [*casting away towel with a heroic gesture*]*:* I'm game!

Turn up house lights during this scene, which is rather repetitive and not really necessary to the advancement of the plot, enabling audience to slip out and smoke, shoot up, buy popcorn.

WISE MARTHA *and* MERRY MARY *go through positions of Ram, Bull, Lion, etc. before moving into more original stuff. As the house lights go down,* MERRY MARY *lies exhausted on bar while* WISE MARTHA *snorts krrf and executes the "Chicken Delight," satisfying* MANNY, MOE *and* JACK *simultaneously, using none of the conventional body orifices.*

WISE MARTHA *joins* MARCEK, *who is counting stacks of money at the table. The other spacers stagger to the bar, sit down and fall asleep, resting their heads on* MERRY MARY*'s comely body.*

ACT III

WISE MARTHA [*sitting down*]*:* Whew! How much?

MARCEK [*counting last stack*]*:* . . . 688, 689, 690. Quite a haul, Wise Martha. But still leaves me—let me see—almost four hundred M's shy.

WISE MARTHA: Nerts. And the boys don't get paid again for almost four weeks.

MARCEK: You might as well take it all then. [*moping*] It's gonna get intensely cold out there. Wonder if you can really learn how to breathe vacuum?

WISE MARTHA: There must be *some* way a down-and-out cirrhotic ex-spacer can earn a couple of hundred M's around here.

Airlock opens noiselessly and another spacesuited figure minces in. Willowy figure steps out of suit. It is **CAPTAIN MCQUEEN.**

MCQUEEN: *Hi,* Marthek.

MARCEK [*burying head in hands*]*:* Oh Jesus God.

WISE MARTHA: If it isn't Captain "Moneybags" McQueen.

MCQUEEN [*blows her kiss*]*:* How's tricks, Wise Martha? [*Leers at tableau of snoring naked spacers*] My, my. It looks like I missed all the fun.

WISE MARTHA [*tiredly*]*:* It wouldn't have been all that much fun for you, Captain.

MCQUEEN [*injured tone*]*:* I like to *watch.*

MARCEK [*mumbling through fingers*]*:* Oh sweet baby Jesus.

WISE MARTHA: Look at it this way, Mar—

MARCEK: *No* way!

MCQUEEN: Whatever are you two talking about?

WISE MARTHA: Just hold on for a second, Captain. [*stage whisper to Marcek*] There's nothing to it, Marcek. It's not like you had to *marry* him! [MARCEK *groans*] Heck, Merry Mary and I do the butch thing all the time, just to keep in practice—you've paid to watch!

MARCEK [*fierce stage whisper*]*:* It's not the *same!*

WISE MARTHA [*exasperated*]*:* Spacers! Why don't you grow up and join the Twenty-first Century?

MARCEK [*pleading*]*:* Why do you think I came to the moon?

WISE MARTHA: All right, all right. Let me see . . . [*to* MCQUEEN] Captain, when was the last time you made love to a woman?

MCQUEEN [*shudders*]*:* Wise Martha! Please!

WISE MARTHA: Forget I asked.

MCQUEEN: It's all . . . wet and . . . secret . . .

WISE MARTHA: *Enough* already!

MCQUEEN: I'm sorry, Wise Martha. You're a lovely person but . . . [*shudders again*] . . . why do you ask? Surely you don't need the money.

WISE MARTHA: It's not for me. They busted Marcek on the cirrhosis clause

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Theirs was a commercial war. So why were uncommercial, not to say unnatural, factors entering into the combat?

NIGHT ON MISPEK MOOR

fiction/LARRY NIVEN

artist/GEORGE BARR

1974

In predawn darkness the battle began to take shape. Helicopters circled, carrying newstapers and monitors. Below, the two armies jockeyed for position. They dared not meet before dawn. The monitors would declare a mistrial and fine both sides heavily.

In the red dawn the battle began. Scout groups probed each other's skills. The weapons were identical on both sides: heavy swords with big basket hilts. Only the men themselves differed in skill and strength.

By noon the battle had concentrated on a bare plain strewn with white boulders and a few tight circles of green Seredan vegetation. The warriors moved in little clumps. Where they met, the yellow dirt was stained red, and cameras in the helicopters caught it all for public viewing.

Days were short on Sereda. For some, today was not short enough.

As Sereda's orange dwarf sun dropped toward the horizon, the battle had become a massacre with the Greys at the wrong end. When Tomás Vatch could no longer hold a sword, he ran. Other Greys had fled, and Amber soldiers streamed after them, yelling. Vatch ran with blood flowing down his sword arm and dripping from his fingertips. He was falling behind, and the Ambers were coming close.

He turned sharp left and kept running. The swarm moved north, toward the edge of Mispek Moor, toward civilization. Alone, he had a chance. The Ambers would not concern themselves with a single fleeing man.

But one did. One golden-skinned red-haired man shouted something, waved his sword in a circle over his head, and followed.

An ancient glacier had dropped blocks of limestone and granite all over this flat, barren region. The biggest rock in sight was twice the height of a man and wider than it was tall. Vatch ran toward it. He had not yet begun to wonder how he would climb it.

He moved in a quick unbalanced stumble now, his sword and his medical kit bouncing awkwardly at either side. He had dropped the sword once already, when a blade had sliced into him just under the armpit. The heavy-shouldered warrior had paused to gloat, and Vatch had caught the falling sword in his left hand and jabbed upward. Now he cradled his right arm in his left to keep it from flopping loose.

He'd reached the rock.

It was split wide open down the middle.

The red-haired Amber came on like an exhuberant child. Vatch had noticed him early in the battle. He'd fought that way too, laughing and slashing about him with playful enthusiasm. Vatch thought his attitude inappropriate to so serious a matter as war.

Vatch stepped into the mammoth crack, set his back to one side and his feet to the other, and began to work his way up. Recent wounds opened, and blood flowed down the rock. Vatch went on, concentrating on the placement of his feet, trying not to wonder what would happen if the Amber caught him halfway up.

The red-haired man arrived, blowing and laughing, and found Vatch high above him. He reached up with his sword. Vatch, braced awkwardly between two lips of granite, felt the sharp tip poking him in the small of the back. The Amber was standing on tiptoe; he could reach no further.

The top was flat. Vatch rolled over on his belly and rested. The world whirled around him. He had lost much blood.

And he couldn't afford this. He forced himself to sit up and look around. Where was the enemy?

A rock whizzed past his head. A voice bellowed, "Rammer! Give my regards to the nightwalkers!"

Vatch heard running footsteps, fading. He stood up.

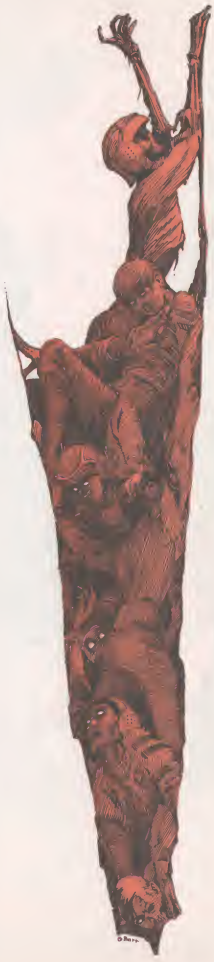
Omicron 2 Eridani was a wide, distorted red blob on the flat horizon. Vatch could see far across Mispek Moor. He found his erstwhile enemy jogging north. Far ahead of him swarmed the army of the Ambers. Above them, the helicopters were bright motes.

Vatch smiled and dropped back to prone position. He was safe. No man, woman or child of Sereda would stay at night upon Mispek Moor.

On Sereda war is a heavily supervised institution. Battles are fought with agreed-upon weaponry. Strategy lies in getting the enemy to agree to the right weapons. This day the Greys had been out-strategied. The Ambers had the better swordsmen.

Seredan war set no limits to the use of medicine, provided that nothing in a medical kit could be used as a weapon, and provided that all medicines must be carried by fighting men. The convention was advantageous to an outworld mercenary.

Vatch fumbled the medical kit open, one-handed. He suspected that the gathering darkness was partly in his own



eyes. But the Spectrum Cure was there: a soft plastic bottle, half-liter size, with a spray hypo and a pistol grip attached. Vatch pressure-injected himself, put the bottle carefully away and let himself roll over on his back.

The first effect was a tingling all through him.

Then his wounds stopped bleeding.

Then they closed.

His fatigue began to recede.

Vatch smiled up at the darkening sky. He'd be paid high for this day's work. His sword arm wasn't that good; he'd thought that Sereda's lower gravity would make a mighty warrior of him, but that hadn't worked out. But this Spectrum Cure was tremendous stuff! The biochemists of Miromon Lluagor had formulated it. It was ten years old there, and brand new on Sereda, and the other worlds of the Léshy circuit probably hadn't even heard of it yet. At the start of the battle he'd had enough to inject forty men, to heal them of any wound or disease, as long as their hearts still beat to distribute the stuff. The bottle was two-thirds empty now. He'd done a fair day's work, turning casualties back into fighting men while the battle raged about him.

The only adverse effect of Spectrum Cure began to show itself. Hunger. His belly was a yawning pit. Healing took metabolic energy. Tomás Vatch sat up convulsively and looked about him.

The damp air of Sereda was turning to mist around the foot of the rock.

He let himself over the lip, hung by his fingertips, and dropped. His belly was making grinding noises and sending signals of desperation. He had not eaten since early this morning. He set off at a brisk walk toward the nearest possible source of dinner: the battleground.

Twilight was fading rapidly. The mist crept over the ground like a soggy blanket. There were patches of grass-green on the yellow dirt, far apart, each several feet across and sharply bordered, each with a high yellow-tipped stalk springing from the center. The mist covered these too. Soon Vatch could see only a few blossoms like frilly yellow morels hovering at waist level, and shadowy white boulders looming like ghosts around him. His passage set up swirling currents.

Like most of the rammers, the men who travel the worlds of the Léshy circuit, Vatch had read the fantasies of James Branch Cabell. The early interstellar scout who discovered these worlds four hundred years ago had read Cabell. Toupan, Miramon Lluagor, Sereda, Horvendile, Koschei: The powerful though mortal Léshy of Cabell's fantasies had become five worlds circling five suns in a bent ring, with Earth and Sol making a sixth. Those who settled the Léshy worlds had followed tradition in the naming of names. A man who had read Cabell could guess the nature of a place from its name alone.

The Mispek Moor of Cabell's writings had been a place of supernatural mystery, a place where reality was vague and higher realities showed through.

Mispek Moor on Sereda had just that vague look, with darkness falling over waist-high mist and shadowy boulders looming above; and Vatch now remembered that this Mispek Moor had a complimentary set of legends. Sereda's people did not call them vampires or ghouls, but the fearsome nightwalkers of Mispek Moor seemed a combination of the two legends: things that had been men, whose bite would turn living or dead alike into more nightwalkers. They could survive ordinary weapons, but a silver bullet would stop them, especially if it had been dumdummed by a cross cut into its nose.

Naturally Tomás Vatch carried no silver bullets and no gun. He was lucky to be carrying a flashlight. He had not expected to be out at night, but the flashlight was part of his kit. He had often needed light to perform his secondary battlefield duties.

As he neared the place of the fallen soldiers he thought he saw motion in the mist. He raised the flashlight high over his head and drew his sword.

Thin shapes scampered away from the light. Tomás jumped violently—and then he recognized lopers, the doglike scavengers of Sereda. He kept his sword in hand. The lopers kept their distance, and he let them be. They were here for the same reason he was, he thought with no amusement at all.

Some soldiers carried bread or rolls of hard candy into battle.

Some of these never ate their provisions.

It was a repugnant task, this searching of dead men. He found the body of Robroy Tanner, who had come with him to Sereda aboard a Lluagorian ramship; and he cried, out here where nobody could see him. But he continued to search. He was savagely hungry.

The lopers had been at some of the bodies. More than once he was tempted to end his whimsical truce. The lopers still moved at the periphery of his vision. They seemed shy of the light, but would that last? Certainly the legends pointed to something dangerous on Mispek Moor. Could the lopers themselves be subject to something like rabies?

He found hard candy, and he found two canteens, both nearly empty. He sucked the candy a roll at a time, his cheeks puffed out like a squirrel's. Presently he found the slashed corpse of a man he had eaten breakfast with. *Jackpot*. He had watched Erwin Mudd take a block of stew from a freezer and double-wrap it in plastic bags, just before they entered the battlefield.

The stew was there. Vatch ate it as it was, cold, and was grateful for it.

Motion in the mist made him look up.

Two shadows were coming toward him. They were much bigger than lopers . . . and man-shaped.

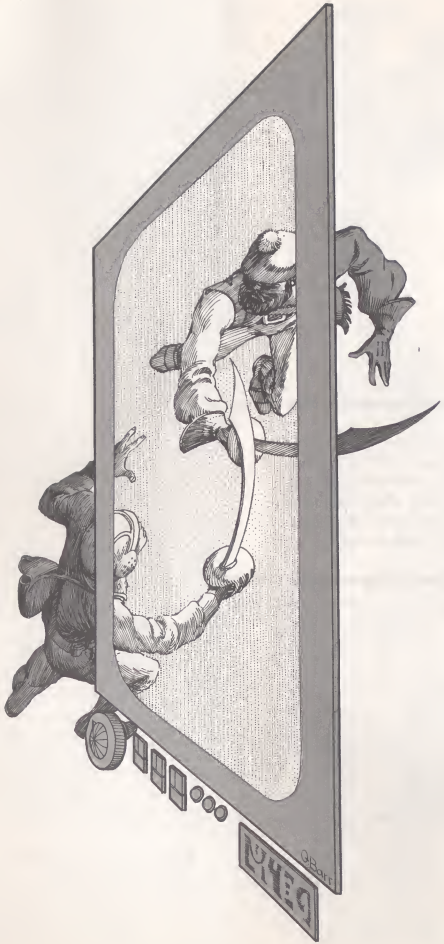
Vatch stood up and called. "Hello?"

They came on, taking shape as they neared. A third blurred shadow congealed behind them. They had not answered. Annoyed, Vatch swung the flashlight beam toward them.

The light caught them full. Vatch held it steady, staring, not believing. Then, still not believing, he screamed and ran.

No matter how hard he fought, how many he cut down, still they came after him, each new attacker climbing over the bodies of those already dispatched, single-mindedly trying to reach the sanctuary Vatch had made for himself atop the rock.

There is a way a healthy man can pace himself so that he can jog for hours across flat land, especially on a low-gravity world like Sereda. Tomás Vatch had that skill. But now he ran like a mad sprinter, in sheer panic, his chest heaving, his legs burning It was a minute



or so before he thought to turn off the flashlight so that the things could not follow its glow. It was much longer before he could work up the courage to look back.

One of the things was following him.

He did not think to stand and fight. He had seen it too clearly. It was a corpse, weeks dead. He thought of turning toward the city, but the city was a good distance away; and now he remembered that they locked the gates at night. The first time he had seen them do that, he had asked why, and a native policeman had told him of the nightwalkers. He had had to hear the story from other sources before he knew that he was not being played for a gullible outworlder.

So he did not turn toward the city. He turned toward the rock that had been his refuge once before.

The thing followed. It moved at a fast walk; but, where Tomás Vatch had to stop and rest with his hands on his knees to catch his breath before he ran on, the nightwalker never stopped at all. It was a distant shadow when he reached the rock; but his haste was such that he skinned his shoulders working himself up the crack.

The top of the rock was still warm from daylight. Vatch lay on his back and felt the joy of breathing. The stars were clear and bright above him. There was no sound at all.

But when his breathing quieted he heard heavy, uneven footsteps.

He looked over the edge of the rock.

The nightwalker came wading through the mist in a wobbling shuffle. It walked like it would fall down at every step, and its feet fell joltingly hard. Yet it came fast. Its bulging eyes stared back into Vatch's flashlight.

Why should a nightwalker care if it sprained its ankles at every step? It was dead, dead and bloated. It still wore a soldier's kilt in green plaid, the sign of a commercial war now two weeks old. Above the broad belt a slashed belly wound gaped wide.

Vatch examined the corpse with self-conscious care. The only way he knew to quell his panic was to put his mind to work. He searched for evidence that this nightwalker was not what it seemed, that it was something else, a native life form, say, with a gift for mimickry.

It stood at the base of the rock, looking up with dull eyes and slack mouth. A walking dead man.

There was more motion in the mist . . . and two lopers came lurching up to stand near the nightwalker. When Vatch threw the light on them they

stared back unblinking. Presently Vatch realized why. They, too, were dead.

The policeman had told him that too: that nightwalkers could take the form of lopers and other things. He had believed very little of what he had heard . . . and now he was trying frantically to remember details. They were not dangerous in daytime; hadn't he heard that? Then if he could hold out here till morning, he would be safe. He could return to the city.

But three more man-shapes were coming to join the first.

And the first was clawing at the side of the rock, trying to find purchase for its fingers. It moved along the base, scraping at the rough side. It entered the crack . . .

Three shadows came out of the mist to join their brother. One wore the familiar plaid kilt from that two-week-old battle. One wore a businessman's tunic; its white hair had come away in patches, taking scalp with it. The third had been a small, slender woman, judging from her dress and her long yellow hair.

wound!)

Out of the crack in the rock came a fantasy arm, the bone showing through the forearm, the first joints missing on all the ragged fingers. Vatch froze. (*Costume*?) The other arm came up, and then a dead slack face. The smell reached him . . .

Vatch unfroze very suddenly, snatched up his sword and struck overhand. He split the skull to the chin.

The nightwalker was still trying to pull itself up.

Vatch struck at the arms. He severed one elbow, then the other, and the nightwalker dropped away without a cry.

Vatch began to shudder. He couldn't stop the spasms; he could only wait until they passed. He was beginning to understand how the fantasy would end. When the horror became too great, when he could stand it no longer, he would leap screaming to the ground and try to kill them all. And his sword would not be enough.

It was real! The dead forearms lay near his feet!

They seemed like a dream, a fantasy nightmare from the depths of a Seredan Hell, but dreams cannot kill, and these walking dead had but one aim—to kill Tomás Vatch before the dawn came to end the fantasy in the light of reality.

They clawed at the rock. They began to spread out along the base.

And Vatch backed away from the edge and sat down.

What the hell was this? Legends like this had been left behind on Earth! Dead men did not walk, not without help. Ordinarily they just *lay* there. What was different about Sereda? What kind of biology could fit—? Vatch shook his head violently. The question was nonsense. This was fantasy, and he was in it.

Yet his mind clutched for explanations:

Costumes? Suppose a group of Seredans had something to hide out here. (What?) A guard of four in dreadful costumes might hold off a whole city, once the legend of the nightwalker was established. (But the legend was a century old. Never mind, the legend could have come first.) Anyone who came close enough to see the fraud could quietly disappear. (Costume and makeup? That gaping putrescent belly

Fantasy!

Real!

Wait, wait. A fantasy was something that categorically could not happen. It was *always* a story, *always* something that originated in a man's mind. Could he be starring in somebody's fantasy?

This, a form of entertainment? Then it had holovision beat hands down. But Vatch knew of no world that had the technology to create such a total-experience entertainment, complete with what had to be ersatz memories! No world had that, let alone backward Sereda!

Wait. Was he really on Sereda? Was the date really 2731? Or was he living through some kind of Gothic historical?

Was he even Tomás Vatch the rammer? Rammer was a high-prestige career. Someone might well have paid for the illusion that he was a rammer . . . and if he had, someone had gotten more than he had bargained for. They'd pull him out of his total-environment cubical or theater in total catatonic withdrawal, if Tomás Vatch didn't get a grip on himself.

Wait. Was that motion in the mist, off toward the battlefield?

Or more of his runaway imagination? But no, the mist was a curdling, swirling line, aimed at his rock.

That almost did it. He almost leapt from the rock and ran. If the city gates were closed he'd run right up the walls . . . But he waited. In a minute he'd know for sure, one way or another.

Within the crack the one he had struck sat slumped with its head bowed, disconsolate or truly dead. The other three seemed to be accomplishing very little.

The dead men from the battlefield streamed toward Vatch's place of refuge. They wore kilts of grey and amber. Less than a hundred of them, casualties in a war between two medium-sized companies, a war which would not have been fought at all if the cost could not be partly defrayed by holovision rights. When they came close Vatch began to recognize individuals. There was Erwin Mudd, whose stew he had stolen. There was Roy Tanner the Lluagorian, the rammer, the medic. Death cancels all friendships.

There—Enough. *Forget about costumes, Tomás.*

Enough, and too late. The nightwalkers swarmed around the rock and began trying to climb. Vatch stood above the crack, sword ready. The sword was all he had.

Hands came over the edge. He struck at them.

He looked around in time to see more hands coming up everywhere along the perimeter. He yelled and circled madly, striking, striking. They were not climbing the rock itself; they were climbing over each other to reach the top. And his sword, its edge dulled by repeated blows against rock and bone, was turning into a club . . .

Suddenly he stopped.

Fantasy? Real? What kind of biology . . .?

He spilled his medical kit open and snatched at the bottle of Spectrum Cure. More than his life was at stake here. He was trying to save his sanity.

The pistol grip fitted his hand neatly. A nightwalker pulled itself over the edge and tottered toward him, and he sprayed Spectrum Cure between its eyes. An eroded face appeared near his feet; he sprayed Spectrum Cure into its mouth. Then he stepped back and watched.

The first one dropped like a sack. The

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FORGOTTEN PLANET

article/George W. Harper

Lots of planets have been called the "Mystery Planet." But there is so little known about Uranus that it isn't even a mystery. It's just plain a forgotten planet.

Some years ago I recall reading an article provocatively entitled "The Mystery Planet." I forget the magazine and remember very little about the article save that it dealt with the planet Venus.

There is nothing remarkable about this except for the fact I recently stumbled across a somewhat dated article also bearing the title "The Mystery Planet." This time the topic was Saturn.

Then, if my memory serves me right, there was a book of the 1930's bearing the title "Mars; Planet of Mystery," or something quite similar.

It might seem this would exhaust the roster of "mystery" planets, but things seldom work out so easily. There is little Mercury, skimming along a stone's throw from the sun and always poorly positioned for viewing. To my knowledge at least two or three texts have referred to it as a "mystery" planet, so the list continues to grow.

Then there is mighty Jupiter, rolling along through the heavens flaunting its "mysterious" Red-spot, hurling out vast waves of radio energy, radiating far more heat than can be accounted for and generally behaving like something midway between a planet and a star. This too has been called a "mystery planet."

And if we do not think Jupiter is mysterious enough, consider remote Neptune, whose massive, lunar-sized satellite Triton, orbits backward about it! Here we have one of the most mysterious phenomenons of the entire system.

Or how about Pluto, the "mystery planet" wandering about on the fringes

"Uranus" is the 'other' planet; the one people forget about. It is just there; filling space."

of the solar system in an eccentric orbit, an unreasonable inclination, an improbable rotational period, a questionable size and an unlikely mass. Since its discovery, Pluto has repeatedly been referred to as "the mystery planet."

There are also the asteroids, which have collectively been regarded as the "mystery planet." Some astronomers prefer to think of them as remnants of a planet which was torn apart, possibly by tidal forces from Jupiter. A few suggest there were originally five planets in approximately the same orbit with millenia of mutual collisions grinding them into small fragments. The majority of astronomers merely believe them to be seed matter for a planet which for some reason—perhaps Jupiter's tidal forces—never quite managed to be born. Mysterious enough for most purposes? Possibly.

But not enough to close the books on mystery planets. Every so often I pick up a journal and read where some vulcanologist, oceanographer, spelunker or whatever calls our Earth a "mystery planet" because of all the things we have yet to learn about it.

When we tally all these "mystery" planets we discover we have accounted for all but one of the planets plus most of the debris of the solar system. Just about everything turns out to be somehow "mysterious." But oddly enough, to my casual knowledge the remaining planet, Uranus, has never been referred to as a mystery planet. To judge by the omission, one of two things must be true; either we already know everything we wish to about it or alternatively, no one knows or cares enough about it to bother. And as our knowledge of Uranus is negligible, we conclude it is because no one actually gets around to thinking about the planet. It is almost literally a "forgotten" planet, too little known even to be called a mystery.

This is particularly ironic because Uranus could very legitimately be called "The Mystery Planet." It has at least two special features which are of unusual significance in understanding the origin and primitive composition of the solar system; features which would no doubt have been recognized for what they are if only they had occurred on some other planet.

The trouble is, Uranus is at an exceedingly awkward place in the solar system; too far out to be easily visible to our telescopes, not large enough to provoke a great deal of attention among astronomers, too faint to reflect an adequate amount of light, not far enough out to qualify as being on the fringes of the system and so generate interest for that reason, discovered too recently to have a massive amount of positional observations available, and discovered too long ago to have a generation of astronomers who grew up with a compelling interest in it. Thus, in every respect Uranus falls just short of becoming a focus of attention. It is the "other" planet; the one people forget about. It is just there; filling space.

Two or three paragraphs cover the known data. Discovered quite by accident by Herschel in 1781, it was first believed to be a comet. Even after the circularity of its orbit was acknowledged there was a strong reluctance to admit it as a planet. Mankind had existed so long with just the classical cluster of planets that many astronomers were simply incapable of admitting there might be others. But within a few years reality was accepted and Uranus was allowed to be a planet.

For a while this made it an occasion of interest. Unfortunately the instruments of the day revealed next to nothing about it. It proved to be an almost featureless greenish colored disk wandering in orbit a little more than 19 times the distance of the Earth from the sun. A few faint bands have been noted, but apart from this no markings have been observed.

Its "year" is 30,687 of our days, or just over 84 Earth years long. Its orbital eccentricity of 0.047 is fairly small, with only Earth, Neptune and Venus having smaller ones. Its inclination with respect to the plane of the Earth's orbit is smallest of any planet; running less than 1°. It also has five satellites tracking around it in grandly circular orbits squarely above the planetary equator.

Our remaining knowledge is summed in Tables I and II, where we contrast it with the other planets of the system. Contained within this table are two vital clues to the origin and primitive composition of the solar system.

Not surprisingly, both clues are deceptively simple at first glance. They are the sort made to overlook. Clue number 1, for instance, consists of the ratio between the mass and radius of the planet, which can be expressed as the mean density.

This certainly seems innocuous. It is hard to imagine a more unlikely clue to the primitive composition of the solar system, but still there is method to our madness. There is also a basic philosophical issue at stake here.

The philosophical issue focuses on the *differences* between the planets. Essentially, if we were to postulate that every planet was somehow captured at random as it wandered in from space, then we should have no occasion for surprise when this or that planet differs fundamentally from another. We could simply shrug our shoulders and argue they came from different clouds having different mixes. But once we commit ourselves to a belief all the planets are part of the same family, then we have to come up with a good reason why they should be different. Presumedly, if we all evolved out of a common cloud, all should have a common physical character, or at most

TABLE I

PLANET	RADIUS (Km)	MASS	MEAN DENSITY	SURFACE GRAVITY (Cm/Sec²)	ROTATION PERIOD	INCLINATION OF EQUATOR TO ORBIT
MERCURY	2,420	0.05	5.3	360	59d	7°
VENUS	6,050	0.80	5.06	850	243d	23°
EARTH	6,378	1.00	5.52	982	23h 56m	23°27′
MARS	3,388	0.11	4.12	376	24h 37m	25°12′
JUPITER	71,400	318.00	1.35	2,600	9h 50m	3°07′
SATURN	60,400	95.22	0.70	1,120	10h 14m	26°45′
URANUS	23,800	14.55	1.56	940	10h 49m	97°59′
NEPTUNE	22,300	17.23	2.27	1,500	15h 40m	29°
PLUTO	4,000	0.10?	4.0?	400?	154h	?

should differ by no more than a few percentage points.

Rather obviously, this is not the case. Mercury is essentially airless. But DeMarcus has shown Jupiter cannot consist of less than 78% by weight of hydrogen while Saturn's value must exceed 63%. Earth has considerably less than 1% by weight, and while the hydrogen component of Uranus is not known for certain, we are positive it cannot exceed 10% of the planetary mass.

So the question is, why are these planets all different? Have we any rational way of explaining the discordancies or must we simply abandon the idea of family unity in the solar system?

Conventional mechanisms, such as kinetic outgassing, where the mean molecular speed of gasses exceed escape velocity, or else approach it so closely that significant numbers of molecules literally fly off the planet, work very well so far as the inner reaches of the system are concerned. But they fail completely with respect to the outer planets. With Uranus, for instance, a temperature of around 9,600°c would be required before the average kinetic energy of hydrogen atoms would exceed escape velocity, and a temperature of well over 1,800°c would be needed before a primitive hydrogen ratio of 78% could have been reduced to the present value.

As the actual temperature hovers around –180°c there is just no way the mechanisms ordinarily considered could lead to the observed results. Molecular loss through thermal outgassing simply does not solve the problem.

Alfven suggested a different mechanism when he proposed that the magnetic field of the condensing sun caused the elements to fall inward at different rates, thereby enriching certain orbital belts within the system at the expense of others. While ingenious, the mechanism lacks conviction. Although there may be some partial separation of certain elements in given orbits, there is no evidence to suggest this would be a strongly marked phenomenon; certainly not enough to make Jupiter 78% hydrogen while Uranus wound up with less than 10%.

There is another mechanism which can account for the observed conditions; a mechanism well known to astronomers but which has never been extended to this specific problem. This mechanism consists of pressure from radiation and the solar wind.

The solar wind is one of the more recently discovered forces of the universe; literally a product of the space age. It consists of the flow of protons which are blown out and away from the sun into space. It is a variable over a wide range; sometimes appearing to vanish entirely, sometimes exerting a force as great as 0.4 grams per square meter of exposed surface at Earth's distance from the sun. Radiation pressure, on the other hand, has been known for many years and is defined as the pressure of light when it strikes an object. It is fairly constant in intensity and runs to about 0.001 grams per square meter of exposed surface at Earth's orbit. Both forces of course decrease inversely as the square of the distance.

On large objects these pressures are negligible, but Pauli and Baade have calculated that radiation pressure alone can exceed corresponding gravitational forces on gas molecules by a factor of from 25 to 100. This means those gas molecules which were lost from the inner planets by kinetic outgassing did not fall into the sun as we might suppose. Instead, they were driven out and away from the system at a slowly increasing speed which would typically see a hydrogen molecule approach Jupiter with a speed of 18 km/sec, Saturn at 24 km/sec and Uranus at 43 km/sec.

As the system is generally planar, almost all these gasses would be blown directly through the orbits of the outer planets. This being the case, each successive planet will have a crack at capturing the fleeing gas molecules, but because they are closer to the sun, sweep a larger segment of their orbit per unit of time, and began with greater masses, Jupiter and Saturn were able to intercept much larger percentages of the outflowing gasses than Uranus.

Calculating back, Jupiter must have begun life with a mass of approximately 101.8 Earth masses, Saturn with a mass of approximately 44.5, and Uranus with very nearly its present mass. We can further calculate that Jupiter, because of its orbit, will intercept approximately 11% of all gasses being ejected from the inner regions of the system. Saturn, being smaller and further out, will collect only about 9%. But Uranus, being far smaller and over four times as distant as Jupiter, would be hard put to intercept more than a small fraction of a percent.

Of course, we cannot assume all of the approximately 217 Earth masses acquired by Jupiter derive from matter lost from the inner reaches of the system. We must also consider that the protons being ejected from the sun are essentially hydrogen ions, lacking only an electron to become ordinary hydrogen once more. No doubt a very considerable part of the hydrogen now on Jupiter has been

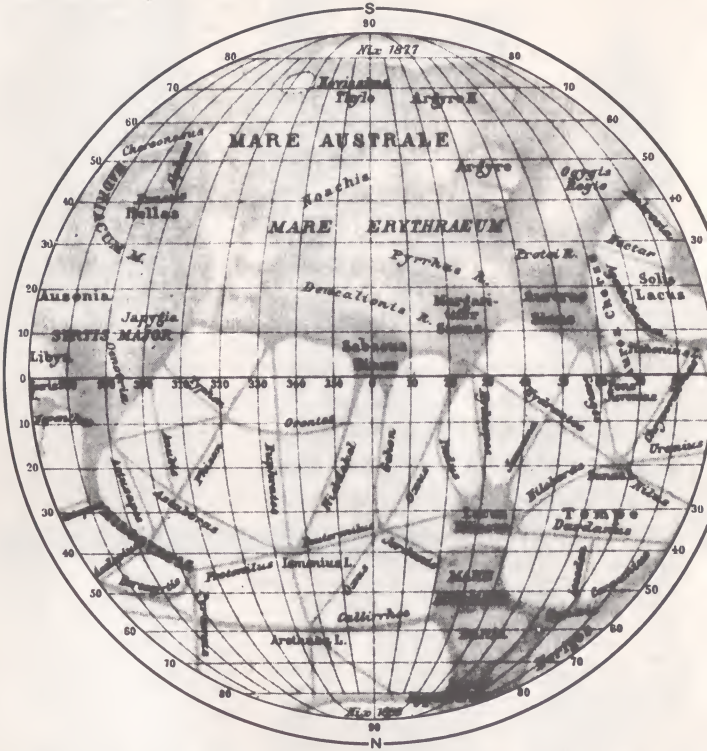
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TABLE II

PLANET	DISTANCE IN Km x 10^6	DISTANCE IN AU	BODE* RULE DISTANCE	MODIFIED* BODE DISTANCE
MERCURY	57.91	0.387	0.4	0.4
VENUS	108.21	0.723	0.7	0.7
EARTH	149.60	1.000	1.0	1.0
MARS	227.90	1.524	1.6	1.6
ASTEROIDS (CERES)**	414.39	2.770	2.8	2.8
JUPITER	778.30	5.203	5.2	5.2
SATURN	1428.	9.546	10.0	10.0
URANUS	2872.	19.200	19.6	19.6
NEPTUNE	4498.	30.090	38.8	29.2
PLUTO	5910.	29.500	77.2	38.8

*NOTE: To derive the Bode Rule, take the progression 0 + 4 = .4, 3 + 4 = .7, 6 + 4 = 1.0, 12 + 4 = 1.6, 24 + 4 = 2.8, etc. The modified rule assumes that whenever a specific condition is met, possibly a lower density factor, the half intervals are filled. Thus, instead of doubling, i.e. 12 + 12 + 4 = 2.8, we would go 6 + 12 + 4 = 2.2.

**NOTE: Ceres, the largest of the asteroids, is usually taken as representing the class.



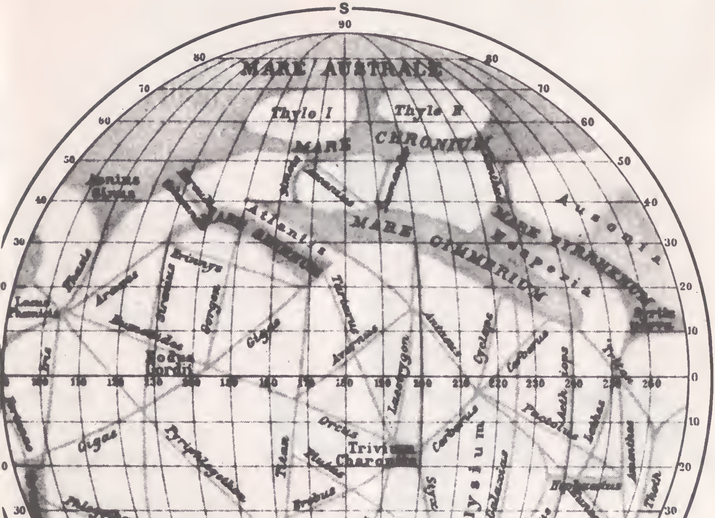
TWO OVER MARS

IGOR BOHASSIAN

Hello Earth. Hello Earth. Mars Calling. Mars Calling."

In the northern hemisphere of that planet called Earth summer was drawing to a close, but sixty million miles away there was no summer, only the black and cold of space, empty except for a harsh and bleak red planet and two small islands of technology—twin spacecraft falling outwards from Earth.

I am in one of those craft. The lead



craft. And soon the radios and telemetry links I am warming will be transmitting floods of data back to Earth from but a few thousand miles above the surface of Mars as I make my flyby. And behind me, in the second, backup, spacecraft, another radio will be warmed, more instruments calibrated and aligned, just in case I miss something, or perhaps even fail in the mission I have worked so hard for.

As a concept in the scientists' minds, my mission is one of the oldest. It was well into the planning stages, both official and unofficial, while to government was still trying to decide on when we were going to attempt the first manned lunar flight. My spacecraft, the fragile shell around me, was taking form in the minds of scientists and engineers on the "outside" while the "in" people were put-

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The mission was to fly past Mars, collecting as much data as possible. For on the basis of this mission would the landing be planned.



AD ASTRA

fiction / HARRY HARRISON
artist / MONTE ROGERS

Mankind had been on the losing end of the war for decades. But there was a way to prevent the ultimate defeat, and Ellem-13 was determined mankind would take that way.

No human being should have been alive in this nightmare world of flame and deadly gas and electronic destruction. The earth had been roiled and heaved again and again, soaked by the poison rain, turned into a moonscape of despair under the rumbling, lightning-pierced sky. No human being should have been here where every breath of air was deadly, every drop of water poison—yet one was. A single man, his protective armor the same dark color as the surrounding mud, sprawled in a shell hole and watching the lumbering approach of the three Nakri land cruisers. Armored juggernauts the size of great buildings, they were immune to the puny weapons that were all the remnants of mankind now possessed. Black-crusted and arrogant they ground on, secure in their invulnerability, immune to any who dared resist. They thought.

Ellem-13 fought a silent battle not to cough, clutching his throat tightly in his hand through the flexible metal fabric of the armor. There had been a slight leak in his left sleeve, really a pin hole, but enough to let a trace of the war gas in. He had sealed off the sleeve but the gas would kill him within six hours. That was not his worry. Within six hours he would either be dead or back at Omega Base where the poison would be neutralized. His concern now was the painful irritation in his throat that was forcing him to cough; yet he could not cough. There were detectors aboard the Nakri cruisers that would filter out the tiniest human sound from the chaotic rumble of mechanical warfare and instantly zero a torp onto the target. He could not cough nor could he move above the level of the ground or his body heat would be detected. He could only lie in the churned, poison mud and control his rebellious body with the strength of his will and watch in the tiny periscope mirror as the enemy rumbled closer. There was a single weapon at his disposal and there would be but a single opportunity to use it. No frailty of the flesh would stop him from making the most of this opportunity. The roaring of tremendous engines and the grinding of immense drive gears grew louder. When the nearest cruiser of the V formation came abreast of the wreck of a rocket bomber that was his range point he smiled grimly, pressed the button on the actuator clutched in his hand and, when the rockets flared, permitted himself the luxury of a long, painful, tearing, wonderful cough.

No weapon manufactured by the ragged remnants of mankind could even dent the armor of one of these giant machines. But every military complex contains the seeds of its own destruction in that it must possess weapons of assault equal to or better than its own weapons of attack. To be efficient militarily is to be paranoid; one must develop stronger and yet stronger weapons lest the enemy develop them first. The Nakri had these weapons—though no terrestrial targets still existed to use them against. But in recent years, in a lesson learned by guerrillas in the earliest days of technological

wars, the enemy's weapons had been turned against them. Lightning raids were launched, and good men died, not to gain any land—for ninety-nine percent of the world's surfaces were controlled by the alien invaders—but to capture a few of the powerful weapons that could be used in the last ditch defenses.

One of these weapons now rose from under the scummed pool of poisoned water that had concealed it. Four meters long, one meter thick, almost all of its bulk given up to the rocket engine that hurled it forward. Normally controlled by a complex electronic guidance system with feedback controls to the mother ship, it now functioned in a far simpler manner. The controls had been bypassed and shorted out, reduced to the single strand of wire that ran to the actuating switch Ellem-13 held, torn away instantly when it was launched. Now it hurtled towards the target area at ever



increasing velocity, its course zeroed in on the large metallic object in the center of its detector field.

Defense was impossible. Microseconds before any of the defense armament could be activated the nose of the torp struck the armored hull and a shaped charge exploded. Not a shaped charge of ordinary chemical explosive, but a charge of gravitically compacted explosive of a density a thousand times that of normal matter. Released now—only in the forward direction—the violently expanding, physically irresistable gasses tore into the cruiser, expanding as they vomited forth, so that although the opening at the time of entry was a mere meter in diameter, by the time the explosion had reached the far side of the machine it was bigger than the cruiser itself so that pieces of metal, plastic—and alien flesh—combined to hurl a column of destruction forth that crashed into the third cruiser in line. It was a matter of an almost irresistable force meeting a not-quite immovable object—and the force won. The great cruiser was turned on its side in the instant, its fabric twisted and torn, the machines inside warped and destroyed, the crewman dead on the instant as the force swept by.

One man had done this. One man with an effective weapon that could only be launched at the closest quarters—and the guts to lie in the poison muck for nine days until the opportunity came to put it into action.

Ellem-13 did not exhult. He slid deep into the shell hole behind the sheltering earth and, once more, his spasm of coughing in control, watched his periscope with grim intent as the third cruiser hesitated. What would it do? His luck had been phenomenal so far—two of the bastards with one torp—so it was unreasonable that it should hold. But should it, *should it*, here was an opportunity that had to be seized and exploited at once. What would the cruiser commander do?

The commander was frightened, he had to be. His two companions had been destroyed by an unknown weapon that might now be zeroing in on his own command. What should he do? First, he reacted with panic. A good sign. On the instant every battery, primary and secondary, loosed off at invisible targets in every direction. A chance explosion shook the ground nearby, slamming it against Ellem-13's suit, but that was all the effect the massive display of firepower attained. As far as the horizon a ruined earth surged up and dropped back again, churned once again, unchanged in the totality of its destruction.

Then the cruiser spun in a tight circle and rushed back in the direction it had come. Victory! The commander would not risk the hundreds of crewmen aboard his command. He would be back—massively reinforced—but in the meantime here was an opportunity that would not be repeated for a long time—if ever. Ellem-13 jabbed the spike of his geophone into the ground and spoke swiftly yet clearly into the microphone.

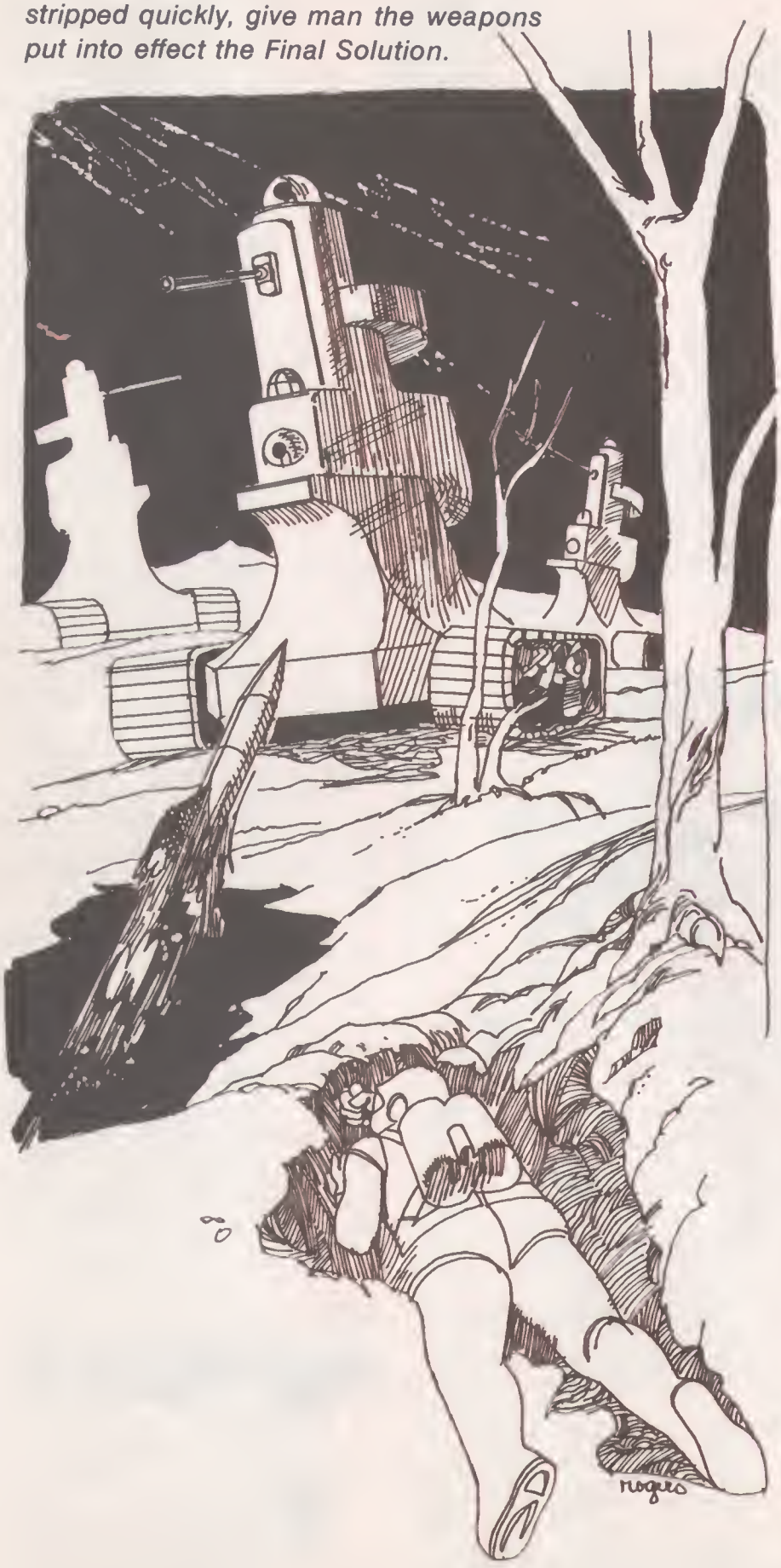
"All stations. Prime alert. Grid position one-four-three-niner. There is a disabled Nakri cruiser here, all crew dead, weapons perhaps intact. Assemble, assemble, assemble! Get what you can! Out."

It was up to the others now. As this realization struck him his muscles relaxed, tension draining, tension that had been building for nine days. It would return soon enough, since only a state of constant attention and alertness made survival possible. But now, for a few blessed moments, he permitted himself to relax. His air filters were clogged and almost poisoned, his water and food concentrate supplies depleted. Others would have to salvage what they could from the wreck. He must return before the gas killed him, that was his task now.

Before the first of the scavengers arrived he heaved himself to his feet and



The captured Nakri cruiser could, if stripped quickly, give man the weapons put into effect the Final Solution.



began the weary trek towards the distant, ragged mountains beneath which, in isolated groups, the last of mankind waited for the final battle with the Nakri invaders.

The harsh blinking of the light drove through his closed eyelids no matter how he turned in his sleep, the buzzer drilling into his ears at the same time. Despite his enormous fatigue Ellem-13 surfaced from the depths of sleep, his first in ten days, and fumbled clumsily at the actuator button. The light and buzzer died and a familiar voice sounded from the speaker above his bunk. It was O'el-2.

"Ellem-13, I'm sorry to wake you. But there was no other choice. The council is in emergency session right now and Jayar-6 has revived his Regrouping Plan. He says it is viable now because of the weapons and supplies from the cruiser . . ."

Ellem-13 cursed viciously and sat up. The room spun about him as the nausea of fatigue twisted his guts; he fought it back and stood, clutching hard to the edge of the bunk above his.

"Get back to the meeting. Stall. Talk. Don't let them vote until I get there. Understood? Over."

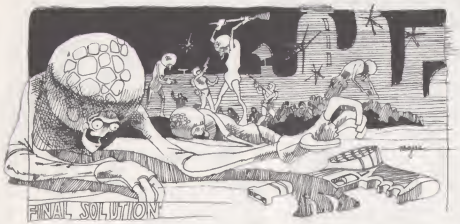
"Out."

Fatigue tore the legs from under him and he dropped back to the bunk, gasping. He would never make it this way. His hand trembled as he opened the plastic case he wore on a thong about his neck. So few left, and irreplaceable. They should be saved for combat—but this was combat too. Decision made he placed one of the green stims under his tongue and waited for the fatigue to be washed away, the artificial energy to seep through his body. Artificial—but real enough. The medics said that a single stim took at least a year off a man's life expectancy. He had long since lost track of how many he had taken. By the time he had rubbed himself down with the trickle of rusty water in the sink the stim had taken full affect. Pulling his soiled coverall on he hurried from the room.

It was a good three kilometers from his quarters to the council chamber and he paced himself at a slow trot. Any faster and the heat would have made running impossible—as it was he was dripping with sweat inside of a hundred meters and gasping for air by the time the first slow kilometer had passed.

At one time all of the corridors had been air cooled, with powered transportation available to all points. That

When mankind went into battle against the Nakri next, it would be the ultimate battle, with only one winner.



had been a long time ago. Now electricity was at a premium and what they had was needed to operate the machines and make the vital areas livable. In between you learned to sweat. His head was swimming by the time he saw the red, sealed door of the council chamber ahead. He leaned against the wall outside of it for long seconds, gasping for breath, controlling his breathing so he would be able to speak. Only then did he press his palm to the detector plate and enter when the door slid open for him.

Jayar-6 was talking, shaking his fist angrily in O'el-2's direction.

". . . insult, no more, that is all it is. To even suggest that I put forth my Regrouping Plan out of personal fear is a degrading observation. I am ready, as we all are, to give what I can for mankind, my life if needs be . . ."

"You have little choice, don't you?" O'el-2's voice was clear as a bell, cool, though the meaning of her words cut deep. She had not seen Ellem-13 enter and was still fighting for time.

"That is too much!" Jayar-6 roared. "I demand the council eject this female. If she were a man I would kill her with my bare hands."

"Save your killing for the Nakri," Ellem-13 said, his deep voice cutting the air so that all present turned and looked in his direction. Slowly and precisely he walked the length of the chamber and seated himself in the front row. "Do I understand, Jayar-6, that you have entered your Regrouping Plan for consideration again?"

"I have. And this time none of your tricks will prevent its passage."

He glared hard at Ellem-13 who returned the expression coldly. Both of them were strong, big men, the weak did not survive long, hard and resilient and not given to compromise. Ellem-13 ran his hand across his short-cropped hair and smiled across at his adversary.

"I suppose you should thank me for supplying you with the material that would make your plan possible?"

"Credit where credit due," Jayar-6 said grudgingly. "Yes, your taking out the cruisers gave us the supplies we need. The counter attacks were held off for ten hours and the damaged cruiser stripped. We have more weapons and supplies now than we have had for years. Final Solution can be delayed and more Sleepers sent . . ."

"*No!* You play loose with facts. You forget the directive. Recorder, I demand privilege, let the decision be read to the council assembled."

There were some mutters of protest, most of the council knew the directive by heart, but most of the thirty-odd members nodded in agreement. The Recorder pressed quick buttons on the console before him, then threw a switch: the toneless voice of the computer sounded from the wall speakers.

RETROGRADE PEAK EIGHT DAYS. EFFICIENCY PEAK THIRTEEN DAYS. DECAY SLIDE FORTY-THREE. EFFICIENCY PEAK NINETEEN. SUCCESS PERCENTAGE EIGHTY-THREE.

A murmur of comment ran through the room. This was the highest the success percentage had ever been—undoubtedly due to the new material that had been captured. But for some reason known only to the computer—which considered all factors such as enemy strength, losses on both sides, morale, weather conditions, everything—the retrograde peak had been moved closer by four days. Every day wasted now in activating the plan would lower the chances of success.

"The computer is not infallible," Jayar-6 shouted out angrily.

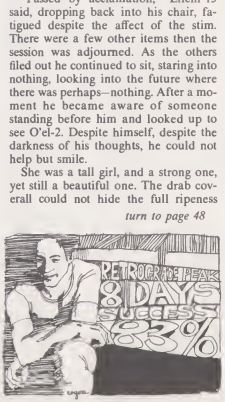
"Nor are you," Ellem-13 said, speaking as calmly as possible. "I do not deny that you are honest in your feelings about Final Solution and your Regrouping Plan. May I remind you once again why Final Solution was brought into being. The war with the Nakri has been going on for close to a century and, for all apparent purposes, has been lost for the past ten. Only the strength of Omega Base had made resistance of any kind possible. The secret of its existence has been kept for all that time because if the Nakri learned it were here they would do anything, including level the mountain range above us, to destroy us. Even our remaining troops in the scattered underground bunkers do not know it exists, thinking only that other positions like theirs are all that is left. And, day by day, the situation becomes more untenable. We have had ten years we did not really deserve. But, when with our backs to the wall, we learned to turn the enemy's own weapons against him, we gained this respite. It has been put to good use. The Sleepers have been sent out and enough information about the Nakri gathered to enable us to mount the Final Solution. It was given that name because it is the *only* solution. We must act on it and act *now*. Any delay would be disastrous. The optimum time to effect it is *now*. We know it is an all-or-nothing plan—but what other choice do we have? *Now* is the time to act. I ask for a vote that Final Solution go ahead as planned. I call for a voice vote. Those in favor . . ."

The ayes rocked the chamber. Only a few voices joined the redfaced Jayar-6 when the opposed were called for.

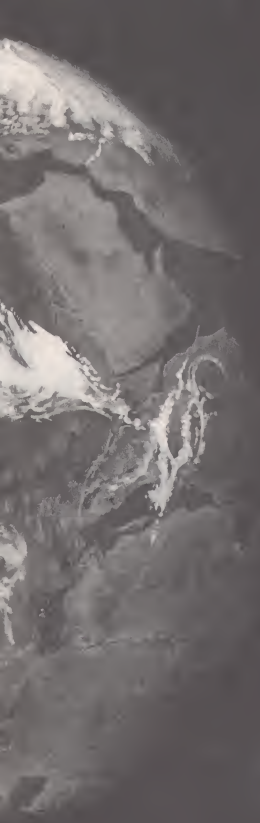
"Passed by acclamation," Ellem-13 said, dropping back into his chair, fatigued despite the affect of the stim. There were a few other items then the session was adjourned. As the others filed out he continued to sit, staring into nothing, looking into the future where there was perhaps—nothing. After a moment he became aware of someone standing before him and looked up to see O'el-2. Despite himself, despite the darkness of his thoughts, he could not help but smile.

She was a tall girl, and a strong one, yet still a beautiful one. The drab coverall could not hide the full ripeness

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The idea that the solid earth is, in reality, a restless, shifting, *moving* place is quite ancient—and surprisingly new, also. For centuries, various Eastern religions have held that ours is a "floating world," forever in flux. Only recently, in the past fifteen years, have most Westerners come to accept that view, and then only after one of the great mysteries of science was finally set to rest by a little French bathyscape's dive last August 9,000 feet to the desolate floor of the Atlantic Ocean.

The bathyscape (a thick-hulled submarine capable of withstanding extreme pressures) was investigating a range of undersea mountains named after their location: the Mid-Atlantic Ridge. Extending south from Iceland in a double chain of peaks separated by a central chasm, the Ridge closely parallels the jagged coastlines of both the Americas on the west and Europe and Africa on the East. On a world map the Ridge looks intriguingly like a joint or seam around which—given a little imagination—the continents might fit, Or might once have fitted.

The first person to develop this line of thought was Sir Francis Bacon, the scholar and proto-scientist, in 1620. Bacon, of course, lacked knowledge of the Ridge; its discovery waited until the advent of high-powered sonar in the 1950s. However, he did have benefit of the new, accurate charts and maps that were one of the fruits of the Age of Discovery, and noted that the contours of South America and Africa on their Atlantic sides were remarkably similar. Indeed, the bulge of Brazil could nestle into the Gulf of Guinea, the coast of Argentina to that of Angola, and the island of Tierra del Fuego could wrap neatly along the underside of the Cape of Good Hope. Bacon wrote his observations in his *Novannum Organum, but declined to speculate further. During the following two hundred years, Bacon's theory enjoyed fairly wide*

LANDS ADRIFT

article/James Sutherland
artist/Leland Long

200,000,000 years ago the supercontinents Lauarasia and Gondwanaland began to break up, and they're still drifting today.

currency, especially among the devout who believed that the continents had been washed apart by the biblical Great Flood. The "scientific" explanations for the supposed continental separation were just as unlikely, for in the mid-1800s there was a vogue for catastrophes that would solve everything from the disappearance of Atlantis to the alignment of the pyramids. One of Darwin's sons, for example, sought to prove that the moon had been wrenched out of the Pacific Ocean Basin by a passing star; Osmond Fisher went on to suggest that this event broke up the continents and set them adrift.

The attendant noise and clatter these theories generated tended to obscure the small, but growing body of scientific data accumulating in favor of the theory of continental drift. Workers in the new sciences of paleontology and geology had uncovered fossils with many similar characteristics in 300,000,000-year-old deposits of coal in both North America and Northern Europe, others pointed out that some subsurface minerals and some mountain ranges appeared to have once been one—and then were sundered by the wide Atlantic.

Were these simply coincidences?

Most of established scientific opinion believed so. For one, much of the evidence had been gathered by amateurs, and the professionals—then as now—were skeptical of those *sans* Ph. D.s. But the second, and even greater reason, was that no truly comprehensive theory of continental drift had so far been assembled from the data by a reputable scientist. In the early 1900s, the theory lacked a champion, another Charles Darwin, to round off the rough edges, to discard the irrelevant, edit, give shape and substance to what was then little more than a maze of facts.

Several attempted the feat, but the one now regarded as the most important and influential was a German meteorologist and geophysicist named Alfred Wegener. Those who work in Wegener's disciplines tend to be rather colorless

About 100,000,000 years ago what is today North America had split off the supercontinent and drifted away, as had Antartica, Australia and India, while South America and Africa remained a slightly cracked whole until only 35,000,000 years ago.



individuals, given over to mathematics and long stints in the laboratory. Wegener developed a strong curiosity of his adventurous life seems to be taken from the novels of Jack London and Jules Verne.

His specialty was the study of climates, and Wegener preferred to make on-the-spot observations when possible as against the usual practice of library research. He was directly involved in several grueling treks to the ice fields of Greenland, and a spectacular record-breaking free-balloon flight, and from these and other experiences, Wegener developed a strong curiousity about the climates of the prehistoric past, a curiosity that could not be satisfied by the scientific dogma of his day: what were tropical plants doing in Northern Europe millions of years ago? And, during the same period, why had there been glaciers in today's tropics? Why are some fossil sea creatures found on mountain tops?

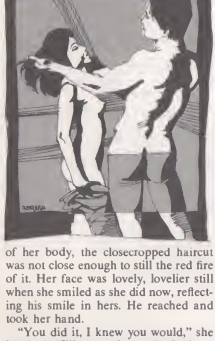
Wegener was unconvinced by the then-current theory that the climates had been radically different. More likely the land had moved. Like Bacon, Wegener was hesitant at first; writing in his book, *The Origin of the Continents and Oceans*, Wegener recalled:

"The first notion of the displacement of the continents came to me when, on studying the map of the world, I was impressed by the congruency of both sides of the Atlantic coasts, but I disregarded it at the time because I did not consider it probable. In the autumn of 1911, I became acquainted (through a collection of references which came into my hands by accident) with the paleontological evidence of the former land connection between Brazil and Africa, of which I had not previously known. This induced me to undertake a hasty analysis of the results of research in this direction in the spheres of geology and paleontology, whereby such important confirmations were yielded that I was convinced of the fundamental correct-

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Some 35,000,000 years ago South America and Africa split apart while India began to collide with Asia, the collision forcing up the crumpled earth now known as the Himalayas, a crash that is still going on to this day.





of her body, the closecropped haircut was not close enough to still the red fire of it. Her face was lovely, lovelier still when she smiled as she did now, reflecting his smile in hers. He reached and took her hand.

"You did it, I knew you would," she laughed. "I'll never forget the look on Jayar-6's face when you made them vote. He's through now, isn't he?"

"Forever. In two days, three at the most, Final Solution takes place. The tunnel is complete and all we await is the final word. It can come any time now—so it is imperative that I ask you something at once. Do you still want my child?"

"With all my heart!"

"Then come with me now."

Afterwards, when they lay close in the darkness together, he told her what could not have been told before.

"The computer has reassigned me. I am to be on the Beta team."

Her scream was a gasp of pain, and when he touched his fingers to her cheeks he found them wet. This was the only protest she made, for duty and obedience were all, but she clasped him with a new ferocity knowing that time, which was running out for all of them, was running even faster now. The alarm came later, when they were asleep, and they rose and dressed and parted without a word.

This was the day.

Ellem-13 was in the combat room buckling into his armor when Jayar-6 came up, working his way through the crowd.

"Like you, I have been reassigned," he said through clenched lips.

"Yes, I saw it when I came in. You are to be on the Omega team. The computer made a good assignment . . ."

"Damn it man, do you think I'm a coward? That I asked for it?"

Ellem-13 took the other by the shoulders with both hands. "Never. I could never think that. I think you act out of good conscience at all times, searching for the path you think best. If I have been unfair to you in public in the past I now apologize. I have done so only to carry forward the plan I am convinced is the correct one. I have never considered you as anything but a noble adversary. You have the correct tenacity of mind to man Omega Base. You must hold out and fight, then fight on still more. Forever if possible. That is essential."

"I believe you. And I shall." He forced the words through tight-clenched teeth. "We will fight on here well past the maximum computer estimate, that I promise you."

"I believe you as well. Goodby."

They moved out. Men and women both, mixed together impartially, unidentifiable in the heavy combat armor. This was as it should be for they were marching to the last battle, the Gotterdammerung of Earth. A battle not against the gods but against creatures from space, from another world, that wanted this world for their very own. They were not finding it easy to take. Mankind had become top specie on this planet because they could either outfight, kill or eat all of the other species. They did not take defeat easily. Now they were assembling for the final battle and what a battle it would be!

Only a skeleton crew, the Omega team remained behind to man the base. This was an all or nothing effort, a balance selected and guided by the computer, a decisive battle that could be the end.

Or the beginning.

They seized up weapons from the armories; atomic rocket launchers, grenade guns, laser rifles, fire lances. All of the weapons were outsize, for the Nakri stood far taller than men, two meters tall on the average, though thin as sticks. All of the weapons were Nakri weapons. Butts had been sawn down, extensions welded on so men could hold and fire them. They were good weapons, far better than the best Earth had ever produced, and the earthmen were eager to turn them against their makers. By ones and twos they went, and then by squads, moving in silence to their alloted places, waiting patiently as the tunnel cars departed one by one, returning empty for another load of humanity, moving forward in ever shortening lines.

The tunnel was over two hundred kilometers long and had taken fifteen years—and far more lives—to build. When it was obvious to Nakri command that all of the human pockets of resistance lay in this area the Nakri had established a space field and supply base behind their own lines. The day the base was established the work had begun on the tunnel—pointing like a dagger in its direction. It ran a mile beneath the ground, too deep to be detected by normal listening devices, and had penetrated to the area directly under the Nakri base. The final digging had taken years, almost a shovelful at a time, carved out by machines activated by a computer. The computer monitored all the surface noises, the arrival and departure of spacers and the blasts of war, as well as a natural geological activity of the area. When the noise level reached a certain pitch the computer activated the machines which dug with mechanical ferocity for the brief time allowed, then fell silent again upon reception of the electronic signal. Upward the tunnel had crawled, a centimeter at a time, slower and slower the closer it came to the surface, until it stopped less than a hundred meters below the base. This remaining soil would be removed only when the final attack began. An attack chamber had been hollowed out here, and this was where the lead units of the strike force assembled. They were tired, the last approach up the steep ramp had been on foot, so they dropped down wearily to recoup their strength for the attack. Ellem-13, as leader of the force, could not rest, but moved about checking with his lieutenants. All was in readiness. Only when he was sure of this did he permit himself to relax, to husband his strength, to sit like the others.

There was a movement among the thick-packed warriors as two men pushed through bearing an ugly black cylinder slung on a litter between them.

"In this alcove," Ellem-13 ordered, and watched carefully while the bulk of the hydrogen bomb was carefully lowered to the ground. "Who is to arm it?"

"I am."

"You have your instructions?"

"I do. I am to activate the deadman switch when the attack begins. I will be the last to join the Alpha team. Two minutes after I release the switch the bomb will be activated. After that it will explode if any human, Nakri or device comes within twenty meters of it, or if it receives the coded signal from the Beta team, or if two days pass with no signal."

"Very good. They'll not find this tunnel to lead them to Omega Base."

"Five minutes," the communications officer said as he received the signal

There was no time left for alternative plans. It was fight and win, or face the extinction of man.

from the battle computer. Ellem-13 nodded.

"You all have your instructions and your targets. To that I can only add—do not take losses. For every one of us the enemy had a battalion. Fire first, destroy when in doubt, all rooms and corridors will be considered defended and will be wasted before you enter. Now take these, they are the last I have."

He passed around his stims to his officers and took one himself. He would not need them again.

This was the final battle.

"Barrage away," the signal officer said, while at the same instant they felt heavy shocks pulse through the ground. The waiting warriors stirred.

"Stand easy!" Ellem-13 called out. "The first torps are for the com center and the supply dumps. We don't move until they start hitting the spaceport area."

The explosions were nearer, louder now. Out there on the plains volunteer squads were launching the torps and barrage rockets. Volunteer because they were suicide squads. The instant their weapons had been used the tracking circuits had locked on to them and explosive retribution launched on its way. Too late to stop their weapons, too quick to avoid death.

"Now!" the communications officer shouted. "Laser!"



From the four meter wide maw of the great machine the irresistable column of coherent light sprang forth. The soil and stone it touched flared instantly into gas, this gas in turn broken down instantly into separate atoms of substance. A surge of monotomic gas was hurled back from the opening, sweeping over them like a tornado. Inlet ports in the combat suits snapped shut automatically at the first contact of the poison fumes that roiled about them thicker and denser, blocking visibility, sealing each warrior away from all the others. But this had been expected, the plans allowed for it, it would cause no delays.

"Punched through!" the laser operator's voice sounded loud in their earphones. Still no one moved as they awaited his next words. "Laser aside."

"Launch sleds," Ellem-13 ordered.

Through the thinning clouds of gas red flames could be seen as the jury-rigged sleds hurled themselves up the angled tunnel. They were light, wheeled frames with a single solid fuel rocket engine welded to their sterns. Each packed full of picked combat troops. Up the tunnel they hurtled, out onto the ground above, their riders tumbling off and running as they hit the ground, dispersing for cover, launching their rockets to join those of the incoming barrage.

And killing every Nakri. Surprise was their strongest weapon and they must make the most of it.

Behind the sleds the jointed ladders rose and the men and women defenders of Earth swarmed to the attack. Ellem-13 was at their fore, and as he emerged into the night air he felt exhultation rise within him. The plan was working to perfection! Buildings burned on all sides, explosions still shook the ground, a fuel dump blew up with a glare that turned the entire horizon red. Smoke and fire were everywhere. Dead Nakri lay twisted on the ground like broken sticks. Unarmed. Good. All the defenses would be on the perimeter while his forces struck from inside.

And strike they did. Hard. Fanning out through the great base, sowing destruction in their wake, each group to its assigned target. Ellem-13 had the primary task of taking out the com center and he was aware of his men behind him as he ran. Ahead of them an attack truck tore around the corner of a building—and instantly burst into flame and exploded as a dozen beams of energy drilled into it. The guards outside the building died at their posts and the warriors of Earth swept in.

It was filthy butcher's work, yet none complained. The Nakri died, shot in the back and from ambush whenever possible. The computer bank was bombed, all of the communications destroyed. It took no time, it took forever, and when the building was clear the recall sounded and they tried not to stagger as they assembled in the great entry hall.

"Two minutes to rest," Ellem-13 ordered. "Casualties?"

"Six. Dead."

"Too many. But now that we have them it is a good number. Let me see them."

The six corpses were laid in a row and he looked them over carefully, impersonally. This too was part of the plan. He pointed to a twisted, unnaturally broken figure.

"What happened to her?"

"Snarl gun. One of the commanding officers had it, he set an ambush."

"No good. They wouldn't have one of those on a ship. Leave her here, bring the others. The two minutes are up."

At a quick run, bearing the corpses between them, they moved out into the night and flame-shot smoke. The fighting had moved on and they encountered no one, alien or human as they hurried to the docking area of the spaceport, moving swiftly past the hulking, burning buildings. Ellem-13 halted them behind a row of smouldering ground cars and peered out intently at the dark form of a great cargo ship that rose up into the darkness beyond. The ramp was down and the port was open—and there was a hint of motion in the depths of the opening. He raised his weapon and sighted it on the port, then changed frequencies with his tongue switch and whispered a single word into his radio.

"Earth . . ."

There was a crackle of static, nothing more, and he began to squeeze down on the trigger before a voice spoke in return.

"Shall live."

A code known only to him and one other.

"He's in! Let's go!"

As quickly as they could they ran across the blast burned pad and up the ramp to the ship. A combat armored figure stood aside to let them in.

"Report!" Ellem-13 ordered.

"The port was open, two of the crew were watching the explosions on the other side of the field. I took them with my knife. Three more inside, two shot. The third was armed, I had to burn him."

"Much damage to the ship?"

"Very little. Smoke and spattered blood. I've cleaned most of it up but I could use some help."

"Good. Very good. You did your job. You two go with him and help with the cleanup. There is to be no trace of any violence inside the ship. The rest of you fan out, make sure the area is clean. I'm bringing in the Alpha team now." He actuated the prearranged signal even as he spoke.

Until they arrived he listened to reports from the other teams. There were losses, there had to be losses, but the enemy command still seemed to be unaware of their presence, and victories were reported on all sides. Four cruisers had been captured and were being manned–they would break out at the right time. The main weapons dump had not been hit, but it was now mined and would be exploded when needed. It was a victorious attack.

Out of the darkness dark shapes appeared, staggering figures attempting to run in survival suits that had never been designed for this kind of activity, particularly when carrying outsize burdens as these were. They went by Ellem-13 at a rush and he followed the last of them deep inside the ship, blinking at the burning light of the freezer hold. They had opened their faceplates now, breathing the chill air of the compartment as they tore into the side of one of the great mountains of flesh.

Protein. Raw, crude protein. A mound of what had once been earth life. Corpses of tigers and elephants, sheep, monkeys, cattle–even men. Piled high and frozen. How it was processed was not known, but it must be used for the raw material of food in some manner. The biological systems of Earth and Nakri were compatible. Wolves ate Nakri corpses with pleasure and no ill affects. Experiments had been made.

Now an opening was being hollowed out in the mound of flesh and the unwanted corpses carried out in a steady stream to a not too distant building. With close, frightening attention, Ellem-13 supervised every step of the operation. It was almost complete when O'el-2 came up to him and waited until he had time to give her attention. He was not aware of her at first, so intent was he on the work. There could be no mistakes.

There could be no mistakes.

Too much was riding on this single operation. When he was done he looked up and there she was waiting for him.

"It is going to work, I know it is," he said, taking her armored hands in his.

"It must," she said, simply.

"It will. There is no trace to show that the Nakri were killed inside the ship. They are all outside the port and armed, killed in defense of the ship. The corpses of our people will prove they succeeded. When we leave, one of them will be sealed in the lock. It will appear as though, mortally wounded, he retreated, closed the lock–and died. Electronic sniffers are checking the corridors for particles, there will be no evidence that we entered. The building containing the corpses we removed will be destroyed by a field combat atomic bomb. There will be no trace of our entry. And you and the rest of the Alpha team will remain in hiding during the jorney to Nakri, your presence unknown."

"And then . . ." There was a trace of indecision in her voice. There was none in his!

"Then you will leave the ship, fighting if you must, but surviving and reaching the highlands. We know the Nakri have body temperatures higher than our own, that their planet has temperate and frigid zones that they do not penetrate easily. We have smuggled others aboard their ships, sleepers in suspended animation, and some of them will have escaped and be established on the Nakri planet. They will aid you. And even if they are not there–you will survive. You *must* survive."

"But, it is such a long way to go."

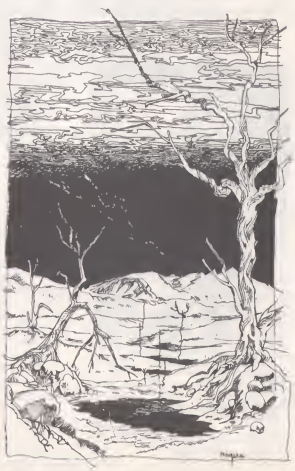
"It is a short way." Even through the gloves she could feel the strength of his grip. "No way is long when it means the survival of Earth, the victory of Earth. We have lost here. We can fight on for awhile perhaps, but that means nothing. In the end we will be destroyed. The battle is yours now–and you will teach our child to lead that battle. You will hide and live and your forces will grow and one day you will begin the fight again. You will carry the battle for Earth to *their* planet and teach them what kind of creature they chose to do battle with when they attacked Earth!

"You will prosper and you will live–and you will conquer and destroy the Nakri. That is what must be done."

"That is what will be done. And, one day, we will return to Earth and it will be ours again. It will be a long way home–but we will do it."

With the open faceplates of their helmets hard pressed together their lips could just meet. They kissed. Then they turned and went away; one from the other, not looking back. The battle for Earth had been lost. The victory was yet to be won. ○

The battle was over, but not the war, for mankind had a long, hard road to walk before he could again call Earth his own, or walk proudly as free men under an open sky.



LANDS ADRIFT

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ness of my idea."

After considerable research, Wegener presented his theory of continental drift in 1922 with the English-language publication of his *Origin.* In that book, Wegener proposed that all the land masses were originally clustered in a super-continent he called Pangea. About 200,000,000 years ago, according to Wegener, Pangea began to break up, slowly at first, then more rapidly around 50,000,000 years ago, when the earth's surface began to assume the familiar continental groupings we know now.

The way the continents moved was like this: the continental blocks which he presumed were made of very hard rocks plowed through the relatively soft basalt rock of the sea-bottoms like a blunt knife cutting butter. Wegener explained this motion by crediting the combined centrifugal force of the rotating earth with the gravitational attraction of the moon. He admitted that these were slight forces; but over the immense sweep of time he built into his theory, he felt that the continents would be gradually tugged into place.

At once, like Charles Darwin before him, Wegener ran full-tilt into hostile critics who tore his theory into pieces where they could and poured doubt and scorn over it when they couldn't. By 1930, continental drift was nearly a spent issue in the scientific community. Wegener died that year, mysteriously vanishing on a dogsled trip across the Greenland Plateau, and his theory seemed to vanish with him. Serious consideration to the idea of drifting continents was not again granted until the decade following World War Two.

The war gave the science of geology several valuable new tools for research. Sonar, the device used to hunt down U-boats by bouncing sound pulses off their submerged hulls, was widely employed in a post-war program to accurately map the bottom of the oceans for the first time. The magnetometer, descended from wartime metal-detecting gear, precisely determined the magnetic fields of seas and lands. And the electronic computer was used to correlate and store the vast amount of new data pouring in to research centers in the United States and Europe—and later, to project and extrapolate from that information the shape of the earth both in the distant past and the far future.

The revival of interest in the theory of continental drift also resulted from a completely new generation of geologists to whom the name of Alfred Wegener was simply a name and not an emotional issue. All the necessary ingredients were present: advanced equipment, well-educated, inquiring young minds, and a fresh climate of thought. The result was a revolution in geology.

Beginning in the 1950s, the study of earthquakes had at last revealed a true portrait of the nature of the lithosphere, the rocky surface of our planet. By studying the ways in which the shock waves from 'quakes travel through the earth, researchers found that the lithosphere is actually two layers thick. The uppermost crust is largely a mixture of rocks bearing the minerals silicon and aluminum, and so named the *sial.* Below it is a layer composed mostly of silicon and magnesium rocks, the *sima.* The lithosphere is separated from the hot mantle of the earth by a zone known as the Mohorovici discontinuity, or the Moho.

This interface, the Moho, is still not very well understood some six decades after its discovery, but its depth has been charted with considerable accuracy. The Moho dips lowest under the continental masses, down thirty or so miles, and rises to within three or four miles of the top of the sial layers that form the sea beds.

The Moho is important for another reason. By its very composition, it helps seismologists locate the origin of earthquakes. The speed of a shockwave in the Moho is different from its speed in the mantle or in the lithospheric rocks. Timing the shocks as they travel at differing depths can pinpoint where they started. In the mid-1960s geologists had recorded the exact locations of thousands of tremors. When these were plotted on a map of the world, they produced a startling picture.

Far from being randomly scattered across the face of the earth, the 'quakes were concentrated in long chains. One such chain completely circled the Pacific Ocean basin; another enclosed Africa; a third was centered on the Indian subcontinent. All together, the 'quake lines divided up the globe in about a dozen sections, or plates. There were some other developments, too.

Interestingly enough, in the Atlantic Ocean the major chain of quakes followed the Mid-Atlantic Ridge line. Was this simply another enticing coincidence, the sort of thing that had led Wegener astray? For a while, nobody knew.

However, a very extensive program of underwater mapping had demonstrated that the Mid-Atlantic Ridge was far from unique; indeed, a whole system of similar ridges seemed to wind around the oceans of the earth like a great pattern of scar tissue. And in other places, instead of underwater mountains, there were huge trenches, thousands of miles in length, dropping in places to valleys seven miles deep.

One vast trench line begins near the coast of Alaska, skirts the eastern side of Japan, swings south around the Philippines, and then bends around the bulk of Australia and disappears in the icy Antarctic seas. And again, this Pacific Trench is the site of thousands of 'quakes and shocks, and hundreds of volcanoes and other examples of tectonic activity. Something is occurring under the ridges and trenches, something with power enough to raze entire cities and create new flaming volcanic islands in the middle of the sea. But what force?

Sonar could supply only part of the answer. It could outline the vast geological structures hidden in the ocean deeps; but to determine what they actually are, and what their purpose is requires an entirely new set of instruments, in fact, an entirely different branch of science.

That is paleomagnetism, the study of the prehistoric earth's magnetic conditions. It is just as possible to understand the nature of the planetary magnetic field as it was many millions of years ago as it is to know what kind of life flourished then, or what the prevailing climate was like. In all three cases there are fossil remains to serve as indicators.

Fresh molten lava has a quality that has only recently come to be appreciated. After it is spewed from a volcano crater or other vent, the lava is generally so hot that it requires at least several hours to cool. During that time period, countless minute grains of iron that are constituent parts of the lava itself will align themselves with the earth's magnetic field. Pointing to the magnetic North Pole and South Pole, the iron fragments are gradually frozen into place as the lava turns into solid rock, and they will stay fixed in those positions for millions of years.

Careful laboratory analysis of these "fossil magnets" can reveal exceedingly slight changes in the long prehistory of the earth, clues that might otherwise have been overlooked or ignored. One of these changes has been the wanderings of the magnetic poles. Currently, the magnetic north pole is some 1200 miles distant from the geographical north pole, so that the direction "north" on a pocket compass is slightly askew from the true direction. The difference is fairly slight; in the distant past, however, it was both considerably greater

and less, for the north magnetic pole has wandered all over the northern hemisphere: from Siberia to Japan to its location today in the Arctic Ocean off the north coast of Canada.

It stands to reason then, that "fossil magnets" in very old lava would point in different directions than would more recent examples. By establishing the age of the rocks (with radioactive dating techniques), and then determining the alignment of the "fossil magnets," geologists arrived at a picture of the meandering poles so complete that they could fix in both time and space. They knew not only where the poles had been, but at what period in time they had been there.

But what was most interesting was that this chart applied *only* if the continents were considered to have been grouped in a single mass 300,000,000 years ago, and then gradually split apart. Without the concept of continental drift, the chart was a disorganized scramble with the poles appearing to have been located in dozens of different locations simultaneously—and according to the physicists, that is simply impossible.

Geologists armed with magnemometers made another discovery that had wider implications. The earth, they discovered, has a distinct propensity for reversing its magnetic field. Examinations of the "fossil magnets" showed that in the past 76 million years, the planetary magnetic field switched itself 171 times—the most recent coming less than a million years ago, and it looks as though it's going to happen again, perhaps within another century. What its effect might be no one will hazard a guess.

These geomagnetic reversals were detected, mainly, by towing a magnemometer behind a low-flying airplane; everytime the plane crosses into an area where the magnetic alignment is changed, the instrument records the alteration. In this way, a large section of ground can be surveyed very rapidly, without the need for extensive, time-consuming surface journeys. While the continents were being checked by air, a similar method was being employed by oceanographic research vessels to detect magnetic anomalies on the sea bottoms.

In the early 1960s, this research started to pay off. Two University of Cambridge geologists produced a new theory to account for the odd geomagnetic data the planes and ships were reporting. Drummond Matthews and Fred Vine had for several years suspected that formations like the Mid-Atlantic Ridge were somehow tied in with the theory of continental drifting; the magnetic anomalies being found by magnemometers seemed to provide the information they needed to make their theory complete.

Basically, the magnemometers had found a pattern of wide, symmetrical stripes to either side of the midocean ridges. Each stripe was as long as the ridge, and dozens, or hundreds of miles wide. Inside each stripe the "fossil magnets" all were oriented in a particular way; in neighboring stripes, all the iron grains were frozen in a different attitude. Outward from the ridges marched a zebra-skin pattern, one magnetic anomaly followed by another having another set of characteristics. The march only ended at the continental shelves, the roots of the lands.

Interestingly enough, found Matthews and Vine, the iron grains in each stripe matched the geomagnetic character of a single time period in prehistory. And there was a set scale, too. The two stripes nearest the ridge crest (one stripe to either side) were aligned according to the current magnetic field. The next two stripes—lying next to and out from the first pair—had an orientation that corresponded to the state of the magnetic field before it had reversed itself to begin the current epoch. The next set of outlying stripes contained "fossil magnets" attuned to the epoch before the second-latest reversal, and so on, across the face of the sea floors.

It was like a colossal magnetic tape recording machine, and the Cambridge team soon figured out how it worked.

The sea ridges were not simply submerged mountains, they were wells that were sunk down into the earth's crust, penetrating below the Moho to the mantle where they drew molten rock up to the sea floor. The molten material would spread out on either side, cool, and thus freeze the iron grains as they aligned with the earth's magnetic field. This was a continuous process, both Matthews and Vine thought, but suppose the magnetic field reversed itself at some point?

The answer was obvious. A new stripe of rock, with newly-oriented "fossil magnets" would be formed. That would go on until there was another reversal.

It all meant that the crust of the earth was not stable. The sea floors were constantly spreading; the continents moving apart left gaps where the upwelling of material from the mantle could form new sea beds.



Matthews and Vine were well aware that there was a limit to this kind of expansion, and proposed that the huge system of trenches performed the opposite function of the ridges. In the trenches the continental plates were being destroyed: the edge of one striking another, then bending slightly, being forced down at an increasingly steeper angle until it was consumed in the mantle. Creation and destruction on a planetary scale such as this would have side effects of considerable magnitude. Hence, the concentration of earthquakes in the ridge and trench systems.

More evidence was added to the



100,000,000 years from now, as the continents continue to drift, the Pacific will be enclosed, eventually becoming an inland sea, a lake, and probably some day disappearing as a new supercontinent is formed, to break up all over again.

Matthews-Vine conjecture by the cruise of an American research ship, the Glomar *Challenger,* in 1969 and 1970. Equipped with a special drilling setup, the *Challenger* was able to obtain core samples from the previously inaccessable crust in the deeper parts of the seas, boring holes to depths of 20,000 feet and more upon occasion.

The objective of the voyages was to determine once and for all whether the Matthews-Vine hypothesis was viable, by returning concrete evidence in the form of fossils, rock and mud for lab study. What the drill crew of the ship was looking for especially was sediment on the ocean bottoms, because much of the theory rested upon the idea that there would be different amounts of sediment in different areas of the sea. The reasoning ran this way: since the oceans were formed, rivers have been carrying sediment into the seas from the land. If Matthews and Vine were correct there should be less sediment on the bottoms that were nearest the ridge chains. That would be newly-created sea floor; conversely, they expected more sediment to be found on the older areas away from the ridges. Sediment would be thickest near the trenches, where the most ancient bottom rocks were being destroyed.

Two years of drilling over most of the world's oceans proved the theory almost beyond doubt. There *was* more silt in the old zones far from the ridges; near the ridges the rocky floor was virtually clean of fallen debris. The *Challenger*'s odyssey has since been acclaimed the most important voyage of discovery of this century, comparable to that of the *Beagle.*

In the new picture of the earth that has emerged, Wegener has been partially vindicated: the continents did—and still do—move, but they are not all. The whole crust of the planet is in motion; the tectonic plates bearing entire continents, ocean basins, and islands are constantly adrift over the magma layer, forever jostling and rattling their neighbors.

The mechanism that keeps the plates in motion is still not well understood. The latest information suggests that the intense radioactive heat energy of the earth's interior is responsible. Radiating outward into the magma, it is believed that the heat sets up convection currents in the magma—currents that gently haul the continents and seas on their plates about the earth in the same way similar types of currents in the atmosphere drive the clouds from place to place.

At the University of Georgia, a re-

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TWO OVER MARS

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ting together the hardware that was to become Apollo.

My ship shares fundamental spaceflight principles with many other spacecraft, including applications satellites, orbiting observatories and deep-space probes. These principles include the capability to operate in space for months, perhaps even years, depending on the scheduled mission. And, of course, there has to be the ability to maneuver after the launch, to refine my course as many times as necessary to make sure I get to the right place at the right time. To make sure I don't *hit* my target, but also to make sure I don't miss it by too much. And, in addition, my ship has to be able to carry the equipment necessary to maintain continuous radio contact with Earth, providing for accurate radar tracking, telemetry, and the use of the big computers on Earth to keep me right on course.

This ship which has brought me across some five light minutes of space is the fourth generation of its kind, which means a lot of research has already been done in making sure its going to do its job. In the early days of the space program, when Ranger missions and spacecraft were being designed for lunar work, some scientists began blending ideas together, looking towards the construction of a truely deep space vehicle. A vehicle which could make a flyby of another planet, first Venus, then Mars.

The deep-space vehicles didn't much resemble the spacecraft which had come before. And my ship doesn't really resemble much those first deep-space craft, especially the first one, built for a Venus fly-by. I'm sure you remember the disaster of that first mission, and the controversy which followed it. The scientists thought they had built a ship capable of operating on the warming orbit between Earth and Venus, but the heat had proved too much for the ship to take, and before it even reached the orbit of Venus transmissions stopped, and nothing has been heard from it since.

Disaster couldn't stop the program, though, and my ship, and its sister, were designed for a different mission — designed to operate in the cold depths between Earth and Mars. And jamming all the capabilities of communication, electrical power, guidance and control, thermal conditioning, mechanical design and science into a ship the size of my Mars probe was a triumph of engineering.

Of course, it is engineering of a design that won't be needed much longer. Mine is the first deep-space mission for scientific research in the vicinity of Mars. The first *science flyby*. The crew of the next mission won't just fly by, though. They'll land. And a lot of the engineering in their ship will have been developed from the lessons learned during my mission. The things that kept me alive will be refined and honed to keep them alive. And the things which almost went wrong with my ship or systems will be changed and adapted for their spacecraft, to make sure the same problems don't hit them, perhaps worse than they hit me.



Mounting an interplanetary mission, even one which isn't intended for a landing, is one of the most challenging of technological endeavors. The Apollo crew found that out with Apollo 8, which simply flew around the moon. Even with a landing, it was as difficult a mission as Apollo 11, which did land. And that was just to the moon.

The energy requirements for interplanetary flight are extremely high, fluctuating between extremely difficult and utterly impossible, depending on a variety of factors. Using our present chemical fuels, launches to Mars with an acceptable energy cost can be attempted just about every two years, when Earth is roughly thirty to forty-five degrees behind Mars in orbit. Launch during that period, or scrub for another two years. Interplanetary tides wait for no man.

Once my ship was launched, once I had made the long burn, there was no turning back. My ship was committed to a journey which was to take months before my objective was even sighted. And there were no way-stations, no repair depots, no rest stops, out there in deep space. There could be no more than the very limited options I had available to me, the switching to back-up equipment, either automatically or by command, in the event of malfunction of one of the ship's systems. If the difficulty went beyond that, there could be no repairs. Later, larger ships might carry the materials and tools necessary to make major repairs, but my ship was but a capsule, an arrowhead on the way to Mars, and a serious malfunction might well mean the *total* failure of my mission.

Because of those factors, the builders did give me the best ship possible. They gave my back-up systems back-up systems. They duplicated every critical system, they beefed every load-carrying part, regardless of weight-penalty, to give me the best chance. In everyone's mind was the fact that there was no turning back, no free return orbit such as Apollo 13 had, no second chance. There were still risks, but those we had to accept, we accepted. Those we could avoid, we avoided. And one risk we avoided was that of having a complete mission failure because of the failure of my

spacecraft. We avoided it by scheduling two missions, two spacecraft, one following the other. Should I fail, my brother behind me, only a few hours further from Mars, will take up where I left off, will finish my mission.

Learning from the Apollo program, decisions were made long before my launch as to the kind of mission I would be flying. In selecting what experiments would be conducted when (or if) I got to Mars, NASA deliberately made this the first truly *planetary* mission. Of the many experiments and experiment packages going with me to Mars, none would start until I had reached Mars. There'd be none of the near-Earth experiments, or solar wind experiments, or weightlessness experiments, or astronomy experiments which took up so much of the time of previous missions. And, more importantly, the leaving behind of those missions would mean more weight allowance for my spacecraft, which in turn would mean more systems duplications and less chance of something happening over which I would have no control.

Once the major design features for the spacecraft were outlined it was time to start putting the hardware together. Over fifteen spacecraft subsystem contractors had to build the various parts of the ship, qualify them for flight use, and deliver them. At the Jet Propulsion Laboratory in California the components, like the parts of a super-complex stereo system, were assembled into four spacecraft. One a test model, two flight-rated craft, and one assembled set of spares. The test model would never fly. But it and its parts would be tested and retested and tested again until every contingency had been covered — we hoped.

After many returns to the test-bench, then still more testing, more simulated emergencies, more loads and overloads, the spacecraft were flight-approved. One would never leave JPL in Pasadena. It would stay as a test vehicle. The three others were shipped to the Kennedy Spacecraft Center on Cape Canavaral. Two were to be shipped farther — to Mars. The other was to standby as a supply of parts and equipment for transplants as necessary in the process of diagnosis-and-cure called the systems test, which would continue right down to liftoff. It was during that period when we had our first real emergency.

Less than two weeks before my scheduled launch we had the vehicle on the pad, undergoing a simulated launch with the propellant tanks empty. Suddenly I started getting warning and abort signals all over the board, as underneath me the rocket began to collapse like a tire going flat.

Most of the structural strength of a modern booster is provided by the pressure in its tanks, a balloon-like design feature which saves a lot of weight. But a faulty relay, one small part, failed, opening the main relief valves, letting the pressure out through six-inch exhaust pipes. As the vehicle began to sag two crewmen on the pad reacted almost instantaneously, running in under the collapsing giant to manually shut off the valves. The pressurizing pumps quickly restored tank pressure, and the launch vehicle on which I was so precariously perched resumed its shape, but there was quite a scar in the side where it had buckled.

He had travelled through millions of miles to his destination. Now his job was just beginning.

Within hours my spacecraft had been lifted off the vehicle by a transport gantry and returned to the hanger for checking, to make sure no damage had been done to it. The launch vehicle which had been scheduled for the follow-up launch, the #2 Mars flight, was comandeered for my launch. Next the ground crew found that they could cut ths preparation-for-launch time in half. A third rocket was shipped out from the factory in San Diego to replace the one being borrowed for me, and the launch schedule, so severely limited by the rules of celestial mechanics, was saved by redundancy and the provision in the plans for just such an emergency as this.

In contrast to most of the Apollo launches, which were scheduled for daylight, my flight lifted off just a little after sunset. And I must say that from the ground it must have been a truly spectacular sight.

All stages of the pre-launch procedure went exactly as planned, and after ignition and liftoff the booster took me up vertically for about 15 seconds before beginning the pitch program. Starting at two seconds after liftoff and continuing right up until the start of the pitch program the ship was rolling about its axis, though, to put it right onto the proper flight aximuth.

Some 138 seconds into the flight the booster engines were shut down then dropped off, to burn up in the atmosphere. Booster Engine Cutoff occurred when some 5.7 g's were pushing down on me, and the signal for BECO was issued by my automatic guidance system. I didn't have a thing to do with it. I didn't go weightless, though, because the SLV-3D launch vehicle sustainer engine continued to burn for almost two more minutes, taking me up to 92 miles above sea level and to a speed of some 8400 MPH.

Just prior to the Sustainer Engine Cutoff the insulation panels on the D-1A stage were jettisoned, and immediately after SECO the SLV-3D and D-1A stages were separated, an explosive charge behind me slicing through the interstage adapter. Retrorockets mounted on the SLV-3D stage slowed it for its long fall back into the atmosphere.

At main engine cutoff I was in Earth orbit at an altitude of 117 miles, moving at 16,480 miles per hour. Not exactly a slow walk. But it was to get a lot faster as the booster's main engines were relit on command sending me out of Earth orbit, into a heliocentric orbit, outward bound to Mars.

The Air Force Eastern Test Range Tracking Net, the Manned Space Flight Network and the Deep Space Network received and relayed information on me and my spacecraft back to the Spaceflight Operations Facility, where it was duly determined that all was going well.

Tracking data showed that the launch was one of the most accurate in history. The spent D1-A stage would pass well to the north of Mars, as planned, and my capsule could be shifted down to flyby trajectory using only about five percent of the maneuver capability onboard. In fact, the flight path calculations looked so good that the maneuver to put me on the proper flight path could be conducted only four days out from Earth. I made the burn on time, and I was on my way to Mars.

Not quite four weeks later my back-up vehicle took flight. This time it was a daylight launch. Again, launch

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FORGOTTEN PLANET

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acquired directly from the sun over the ages.

But either way we choose to look at the matter, Jupiter and Saturn become wholly unreliable as indicators of the primitive composition of the planets. Only Uranus and Neptune offer any reliable information in that area, and even though Neptune would probably be slightly better as a source, its vastly greater distance from the sun and Earth is simply too great an obstacle. Uranus clearly offers the better prospect for investigation and discovery.

So much for one of the special features of Uranus.

The other clue, the real mystery, consists of the equally innocuous looking observation that the inclination of the equator to the orbit is 97°59′. The planet is literally rolling along on its side as it tracks around the sun! At one season of the year the sun is almost directly over the north pole, with the entire southern hemisphere shrouded in utter darkness. A quarter of a Uranian year later the sun is over the equator. Another quarter year and the sun rides almost stationary over the southern hemisphere, looping in an 11 hour circle 16° in diameter over the south pole.

The oddity of this inclination is compounded when we discover five satellites tracking over the equator of the planet with orbits inclined 0° and with eccentricities ranging from a phenomenally small 0.007 to a quite small 0.01. This means the satellites move at right angles to the plane of the solar system, an unheard of peculiarity not found anywhere else in the system.

To understand the significance of this awkward inclination a brief summary of the various attempts to solve the problem of solar system origins is needed. And as the Kant and Laplace hypotheses were among the earliest which sought to establish a scientific basis for the subject we may as well mention them first even though they have been discredited on other grounds.

Though differing in detail, both hypotheses assumed a primeval, disc-shaped mass of gas and matter extending somewhat beyond the orbit of the outermost planets and revolving in a counterclockwise direction. As this mass of gas contracted and began developing into the sun, it began rotating ever more rapidly until the centrifugal forces reached a critical level and the sun bled off some of the excess angular momentum by throwing off portions of the disc. One after another, rings or globs of material were separated from the contracting sun; each forming the nucleus of a successively closer planet.

The theories themselves have numerous defects and are now mainly of historic interest, but even if there were no other objections they would still run afoul of the Uranian inclination. It is clear that the residual material left behind would be rotating in the same sense and along the same axis as the sun. We could perhaps ignore deviations of a few degrees, but an inclination of 98° is out of the question. With any system where the sense of planetary rotation is pegged to its relationship to the sun, a planet such as Uranus simply cannot exist. For the Kant-Laplace hypotheses to be correct, Uranus cannot be!

Another now discredited theory by which astronomy sought to account for the existence of the solar system assumed a collisional or near-collisional passage of an errant star which succeeded in pulling a long streamer of material from the sun, and perhaps losing a streamer of its own at the same time. This material quickly broke up into gigantic 'droplets' which then coalesced into planets. Later modifications of this theory postulate our sun as part of a binary system and argue the wandering star actually collided with the other star, sending both caroming off into space leaving behind a long ribbon of matter which later coalesced into the solar system. Yet another permutation of the theme eliminated the wandering star and proposed a binary system where one star erupted into a supernova, throwing off great gobs of matter in a moderately assymmetrical fashion so the supernova rocketed off into space leaving behind a scattered rubble of matter which ultimately coalesced into planets circling the remaining star.

Taking the first of these hypotheses, and assuming no other objections, we find we are still unable to account for Uranus. If all the material in the planets came from one of these stars, then all the planets would have to have a common inclination; perhaps allowing a degree or two for accidents. If we postulated two origins, say that the planets out to Saturn derive from this sun while Uranus through Pluto derive from the passing star, then we could arrive at two inclinations. But as Uranus is the inner planet we would have to find a similar inclination in Neptune if we are to sustain the argument. Since we do not, we

TABLE III

SATELLITES OF URANUS

NAME	DISTANCE FROM PLANET Km x 10^3	INCLINATION OF ORBIT	ECCENTRICITY OF ORBIT	RADIUS OF SATELLITE
MIRANDA	130.35	0	0.007 (Approx.)	200 (Approx.)
ARIEL	191.80	0	0.0028	300
UMBRIEL	267.30	0	0.0035	200
TITANIA	438.70	0	0.0024	500
OBERON	586.60	0	0.0007	400

BODE RULE FOR URANUS SATELLITES

NAME	DISTANCE Km x 10^3	EQUIVALENT DISTANCE	BODE RULE	MODIFIED RULE
MIRANDA	130.35	0.487	0.4	0.4
ARIEL	191.80	0.717	0.7	0.7
UMBRIEL	267.30	1.000	1.0	1.0
TITANIA	438.70	1.641	1.6	1.6
OBERON	586.60	2.194	2.8	2.2

have to reject this approach also.

Taking the second of the theories and assuming each of the three stars contributed material to the system, we could juggle things around enough to permit a rather strained postulation of Uranus as the solitary contribution of the third body. But this theory must be rejected on other grounds. It has been calculated that for at least a decade following such a collision the residual material would be subjected to a three-way gravitational stress which would disperse whatever homogeneity the original gaseous filaments might have possessed. Rather than coalescing into planets, the material would have decayed into a thin gas which would then have been blown out of the system.

The problem with the supernova approach is exactly the opposite. Rather than trying to explain why Uranus has so odd an inclination, it would become necessary to explain the regularity found in the system. How could we possibly find four of the nine planets with inclinations ranging between 23° and 29°? Why should we find 8 of the planets with inclinations less than 7°, and seven with inclinations less than 3°? And if we can explain this, then how do we come back to one planet with an inclination of 98°?

If might be argued we are merely puncturing already deflated balloons. All the theories so far have already been discredited, so why bother adding one more objection? But when we consider all theories of the origin of the system evolved from these two basic alternatives, accidental acquisition of planets as a result of collisions, capture or whatever, and creation of planets as a necessary consequence of the formation of the sun, we come to realize our rehashing of older theories has a purpose. It points up the necessity of accounting for Uranus. It shows us the need for some decoupling mechanism which severs the planet from a need to accord with its neighbors, at least in the matter of inclination . . . Either that or we must look to the possibility Uranus was originally inclined like the other planets and some mishap occurring after the planet formed accounts for its exceptional inclination.

Looking at this latter alternative first, *a priori* an event of this sort must either have been caused by an outside agency or by some internal imbalance within the planet. There are simply no other possibilities.

So let us assume an outside agency, a transient gravitating mass passing close by the planet. We suppose the tidal pull of this mass was sufficient to drag the polar axis around to its present inclination. Never mind trying to figure how this could be done, just assume it is done and Uranus is left out of step with the rest of the system.

Unfortunately we cannot even do this. While we can perhaps assume unknown forces tilting a planet on its axis, we would certainly also find it necessary to consider the effect of such forces on the orbit of the planet. If it is powerful enough to tilt a planet, it is also going to be powerful enough to disturb the orbit. And here we note the orbit of Uranus is one of the most regular in the solar system.

There is the added fact that for a gravitating mass to tilt the planet it would have to exert enough force to destroy the far smaller satellites outright or at least pull them out of orbit. No conceivable application of force could simultaneously tilt Uranus on its side and at the same time pull the five satellites around in continued equatorial orbits with negligible eccentricities and zero inclinations.

But we are no better off is we speak darkly of unknown internal imbalances causing the planet to tilt. We still have the problem of the satellites to face. What sort of force could drag them along until they finally came to rest over the equator once more? And if such a force exists, then why has it not worked on our moon, pulling it down to a 0° inclination also?

This brings us squarely back to the need to find some mechanism within the actual creation of the solar system to use in accounting for Uranus. So now we take a look at the modern theories and see whether we find any help there.

There are only five in contention. There is Alfven's work which seeks to derive the system as a consequence of the solar magnetic field. Then there is von Weizsäcker's vortes hypothesis which assumes turbulent eddies in space and the gradual accretion of planets at the interface between these eddies. Kuiper modified this hypothesis by denying the vortices or eddies and instead assumed condensation of the planets within the turbulent cells themselves.

Whipple proposed what might best be called a "double cloud" hypothesis in which the sun as postulated as having condensed from one dust cloud. This cloud had a negligible angular momentum so the resulting sun had a rather slow rotational period. After a period following condensation the sun captured a smaller cloud possessed of a larger angular momentum. Then the second cloud breaks up and forms the planets.

A final approach is generally referred to as the "Russian hypothesis." First advanced by Schmidt in 1943, it assumes the sun first captured a swarm of particulate objects from an interstellar cloud. These particles then grew to planetary size by accretion. A 1950 modification argued that the sun and particles came from the same cloud. This eliminated the need to postulate two separate events, a condensation of the sun out of one cloud plus a subsequent capture of matter from a second one.

Not all these hypotheses are equally strong. Alfven's theory, while it contains many interesting points, and in particular decouples planetary inclinations from the sun, is nevertheless impossible. Quoting Cameron, ". . . it supposes on the one hand that the atoms will come from very large distances from the sun without suffering collisions, so that their kinetic energy is equal to the total gain of potential energy. On the other hand, Alfven assumes that collisions are so frequent that the atoms are ionized as soon as their kinetic energy is large enough for ionization by collision. Thus, at the same time, the mean free path has to be both large and small as compared with the dimensions of the solar system. Since even in average interstellar clouds the mean free path is not large as compared to the dimensions of the solar system, it follows that the mechanism which is the basis of Alfven's calculations is impossible."[1]

As the same objection can be raised against other related theories, it appears the magnetohydrodynamic approach fails. There may be considerable merit in the suggestion magnetic or ionizing effects have weighted the distribution of elements found in the different planets, but it is clearly unworkable as an explanation of the origins of the solar system.

Skipping down to the Whipple theory, we have something which is perhaps marginally feasible. But it would require an outrageous number of accidental coincidences. Why the planets would condense along a common plane is unclear. The Bode-Titius Rule would seem to be a mere accident. Planetary inclinations are random and satellite orbits happenstance. Whipple merely postulates the regularities of the system. In effect, what he does is throw in arbitrary factors to account for whatever he chooses. Is the rotation of the sun a problem? If so, then throw in a little of the cloud as a leftover; just enough to fall into the sun and give it the needed angular momen-

The planet no one thinks of is rapidly becoming a thorn in the side of astronomical scientists.

tum. Is Jupiter too big? Then make the cloud a little denser there. Is Uranus uncomfortably inclined? Then assign a separate, random motion to that part of the cloud. If you do enough of this you can explain almost anything. But it always lacks conviction. You wind up with a gigantic improbability which could conceivably be right; but you hope not.

Still skipping around, we see the Kuiper theory is also untenable. This is a shame because in many ways his turbulence theory is attractive. It is certainly one of the simplest models ever advanced. All we have is a cloud of dust and gasses in turbulent motion. Kolmogoroff showed that such a cloud would naturally break up into irregular cells, each with its individual turbulent motion. Kuiper expanded on this to argue that one or several of these cells combined to create our sun by condensation. When the sun was still only weakly radiating the surrounding turbulence patterns were basically affected only by the gravitation of the system. They were in orbit about the sun, but other phenomena, such as radiation pressure, solar wind, etc., were not yet operative. At this point the turbulent cells, or at least some of them, began an independent condensation, collapsing in upon themselves to create nuclei for planets to develop around.

There are ways of strengthening this hypothesis, expanding it to include still other anomalies of the system. The whole concept has enormous flexibility. But there are two things Kuiper's theory cannot achieve no matter how it is modified. For one, nothing even approximating the Bode Rule can be derived from it. And secondly, as we have already postulated the turbulent cells are in orbit about the protosun, it is clear no condensation can occur until the individual cells have been oriented with respect to the sun. And once this occurs we are going to wind up with planetary inclinations neatly aligned with the sun. So here again there is simply no place for Uranus.

Turning now to the Russian theory, we quote Cameron. "Friction of the dust particles with the gas is supposed to cause the particles to accumulate as a very thin disk in the equatorial plane. It then accumulates into asteroidal-sized bodies, possibly via collision accumulation, but more likely from a local gravitational instability of the dust particles themselves. As the bodies grew in size, their originally circular orbits would become changed to elliptical ones, due to perturbations during close passages with other asteriodal-sized bodies. As the orbits became more elliptical, the probability of close encounters and collisions increased. The collisions would sometimes result in combinations and sometimes in fragmentation of the asteroidal sized bodies."[2]

A point critical to the whole theory is the thin disc on the equatorial plane. Without this there is nothing. But once we accept the thin disc we are also compelled to accept the corollary that all collisions will take place along this same plane. By extension, all transfers of angular momentum capable of determining planetary inclinations will occur there too. In short, it is difficult to explain Earth's inclination of 23°. Accounting for Uranus is simply out of the question!

This reduces us to a single theory. And as we have deliberately left it to last it should come as no surprise to find it is the only one capable of accounting for Uranus.

In Weizsäcker's theory we begin with the condensation of a star from interstellar gasses and debris. As material falls toward the center of gravity turbulence develops. Ultimately the star is girdled by a thin, rotating disc with a diameter approximately the same as the orbit of Pluto.

Like the rings of Saturn, the particles in the disc will be in orbit so nearer particles will have higher velocity than those further away from the sun. This implies the existence of friction between particles, with the inner always possessing somewhat greater momentum than the outer. The effect of this is to drive the particles into more nearly circular orbit.

The same force also tends to disperse them, but Weizäcker pointed out that under some circumstances it will create countercurrents, or vortexes, possessing high stability. As these vortexes are not solid objects rotating about a fixed axis, local circumstance will modify the predicted positions and there is no absolute requirement for the formation of a planet with a specified mean distance, inclination to the ecliptic or equatorial inclination.

As a rule planets will form in positions reasonably close to the predicted Bode-Titius position, but deviation in all parameters can be expected. It therefore becomes possible to explain the inclination of the Uranian equatorial axis in terms of an inclined sheer zone between two vortexes. The interface of the vortexes from which Uranus formed must have had a slope of only 8° from the horizontal, with the 'inferior' vortex riding over the 'superior.' The satellites would be a consequence of secondary vortexes forming around the condensing planet. And by this hypothesis we find we have decoupled the planets from a direct dependence on solar influence. Instead, they become a product of the interrelationship between vortexes.

But the vortex theory is initially proposed suffered from a grave technical weakness. Considering the interface region between the two opposed currents, we can calculate the relative velocities with respect to one another in terms of the mean distances of successive vortexes from the sun. For example, a vortex filling the region between Saturn and Uranus would have a mean orbital velocity around 8.0 km/sec. As the vortex is literally rolling around like a tracked vehicle, we can calculate that the portion of the vortex abutting Uranus' orbit will have a net positive velocity of some 1.2 km/sec. But the superior vortex will be tracking at a net velocity of 12.8 km/sec at the same point, giving a point-of-contact difference of 11.0 km/sec.

It is evident a velocity differential of this magnitude would impart a very considerable kinetic energy to colliding particles. Within a short time a zone of turbulence would separate the two vortexes, with the depth of the turbulent region being a function of the density of matter within it. According to the Weizsäcker theory the effect of the velocity differential upon this turbulent interface would be to create a series of circular vortexes rotating counter-clockwise, more or less as a set of roller bearings upon which the main vortexes would ride.

But this would be a highly stable configuration and it is difficult to conceive any process by which these interface vortexes, or cells, could then form into planets. The centrifugal forces would inevitably exceed the gravitational force and only the presence of the principal vortexes would prevent the whole system from blowing itself apart.

However, we can see this would apply only if the density of matter was initially equal on both sides of the cell. In all other instances we would have not a rolling bearing but something more like an eccentric cam as material would be derived from both vortexes in proportion to their density. Thus one limb of each cell would invariably possess greater mass than the corresponding limb on the other side, with the difference depending on the density ration between the two

LANDS ADRIFT

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vortexes.

This means that as the cells rotate they will alternately rise above the interface then sink below it. No matter how long the process continues there will be no damping effect and the oscillations will remain a permanent feature of the system. In addition, there will be a gradual diffusion of material throughout the cell, plus some seepage from the cell to the superior vortex. We therefore conclude the interface region will be in a state of continual growth, and if the vortex possesses only a finite amount of matter, then ultimately the bulk of this material will come to be concentrated within the interface.

Eventually a new balance point will be reached where the loss of material from the turbulent zone will equal the entry of new matter from the inferior vortex. But before this can occur the density of matter in the turbulent zone must be substantially greater than the density of either of the two adjacent vortexes. Ultimately a different sort of balance will be reached where the progressively attentuated vortexes will be incapable of maintaining the turbulence throughout the whole cell. At the core a region of comparative quiet will emerge as the nexus for the protoplanet now growing.

As we noted earlier, the inclination of the protoplanet with respect to the sun is a function of the sheer angle between vortexes. In general these would tend to be rather small, but in principle almost any angle is possible. In Uranus we see one of the more extreme cases, but there is nothing outlandish about it so far as the Weizsäcker theory is concerned. In almost every other theory it is a fatal stumbling block.

Even if presently unsuspected objections cause us to throw out the Weizsäcker theory in its entirety, this still will not change the status of Uranus. Regardless of what theory finally gains acceptance, it must be able to account for the known inclinations of Uranus and its satellites before it can be considered adequate. Thus, this obscure, remote, otherwise unremarkable planet rolling along on its side on the fringes of the system is, and must remain, one of the essential criteria for understanding the origins of the whole solar family.

This is quite a challenge for the "forgotten" planet.

NOTE 1: *Origin of the Solar System, Jastrow & Cameron, Academic Press, 1963. pp 20-21*
NOTE 2: *Op cit. p 31.* ○

search team has recently suggested that the mechanism may involve, in addition, the unequal heating of the plates from below. Alternative ways of propelling the plates have been offered by several other scientists in the U.S., who believe that the convection-current hypothesis cannot supply the admittedly vast quantities of energy required. A rough estimate of the energy spent by the shifting plates in only one year is on the order of 10^{25} ergs, far more power than contained in all the world's nuclear arsenals.

If there is disagreement over *how* the plates move, then there is virtually none over where they are going and where they began.

300,000,000 years ago, the world was roughly divided into two great land masses. In the Northern Hemisphere was the huge continent of Laurasia, a combination of our North America, Europe, Greenland and most of Asia. The Atlantic Ocean either did not exist, or was present only in the form of a river. To the south of Laurasia was Gondwanaland, a cluster of today's Africa, South America, Australia, Antarctica and India.

The masses were divided by the greatest sea of all time, the Tethys Ocean. Until 200,000,000 years ago, this primordial sea completely encircled the globe, though the Laurasia-Gondwanaland strait was never very wide.

At that point in time, the breaking up of the land masses commenced, triggered by some unknown event. Egon Orowan of M.I.T. has calculated that an asteroid striking the earth could have done it, two physicists at the University of Illinois suggested it was caused by the capture of the moon, and there are other possibilities.

North America split off from Europe and drifted westward. Africa and South America remained in a geological embrace for another 120,000,000 years; by that time the plate bearing the Antarctic had slid down to the south polar region, while Australia headed off into the emerging Pacific and India broke free of the eastern coast of Africa and drifted northeastward, toward the rim of Asia.

About 35,000,000 years ago, South America and Africa had gone their separate ways. The plate bearing India started to collide with the Asian plate, crumpling and forcing up the Himalayas. North America was still travelling west, bumping into the Pacific Ocean Basin plate, forcing it to dive under Asia, in the process creating Japan, the Philippines and many other islands. The Atlantic sea floor, fed by fresh material from the Ridge magma well system, continued to spread out. A little later Africa began a slow, majestic clockwise rotation that shut off the last bit of the Tethys, opened the Straits of Gibralter and so formed the present Mediterranean.

There is every indication to believe that the rearranging process will continue, in a similar fashion, far into the future. Earthquakes in the earth's ridge and trench systems are clear signals that the continental plates are still restless; some seismologists think there has been an acceleration of tectonic activity in this century, most notably all around the periphery of the Pacific Ocean Basin.

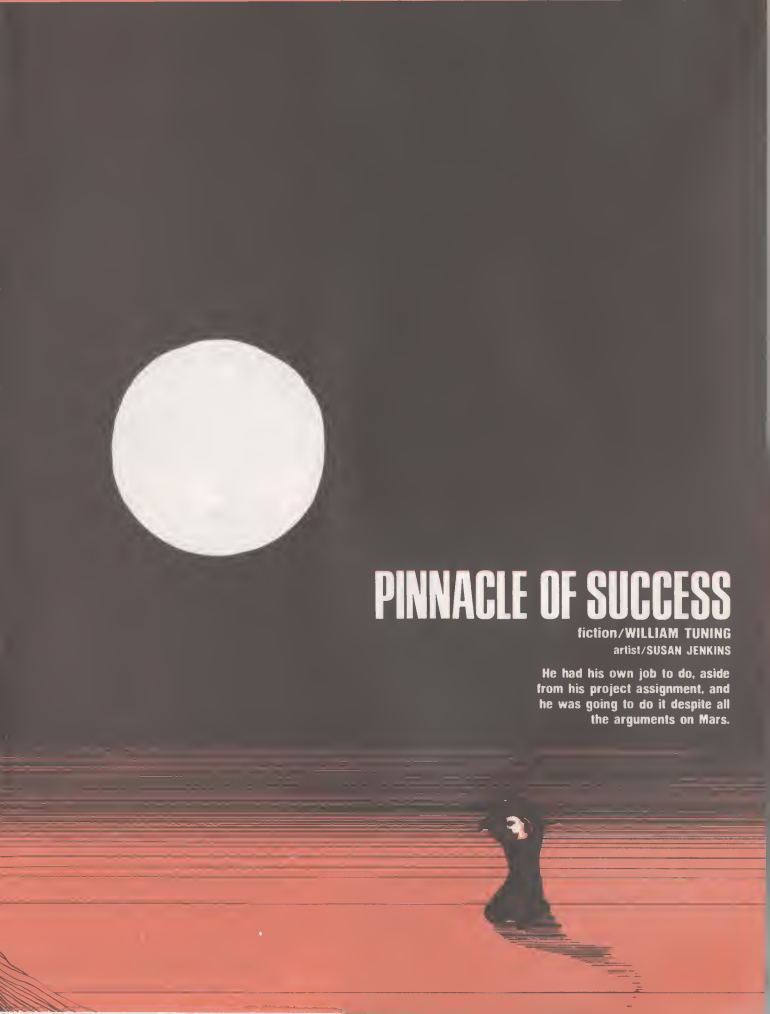
Last summer the French bathyscape *Archimede* explored the Mid-Atlantic Ridge near the Azores and found evidence that the system is active: new rock to either side of the ridge crests, filling in the gap as the ocean floor widens imperceptibly. There will be additional descents this year, coinciding with a 52-nation study of global geodynamics, a sort of son of IGY. Geologists hope this intensive project will clear up the conflicting theories that now surround the concept of continental plate drift, and settle the question of how the plates move.

Already, they know enough to project a scenario of possible future drifting. The Atlantic, they believe, will keep expanding while the Pacific shrinks. In the southeast corner of the Pacific plate, the sea floor is moving at five inches annually westward, retreating from the North American plate, and suggesting that the coasts of Asia and North America may meet in the year 60,000,000. The rotation of Africa will shut the Straits of Hercules, but in compensation, the present-day Red Sea will widen to connect the Mediterranean and Indian Ocean with a natural canal a hundred times larger than Suez.

Projecting further, it seems likely that a new island or chain of islands will be pushed up in the remains of the South Pacific Basin. In turn, that may well be enclosed by South America, Australia and Asia-North America, thus combining all the lands—except for Antarctica—into a single continent, a new Pangea.

Whether there will still be people around to witness such an event is, of course, sheer speculation. If some remain in that remote time, and have access to the knowledge of their past, they may well decide, then and there, to place a marker in memory of Alfred Wegener, the man who was right in the end. ○





PINNACLE OF SUCCESS

fiction/WILLIAM TUNING
artist/SUSAN JENKINS

He had his own job to do, aside from his project assignment, and he was going to do it despite all the arguments on Mars.

Being buried alive wasn't Stevenson's idea of a good time, even though he was protected by the tough shell of his crawler, which kept him from being crushed as well as insuring the integrity of his breathing mixture.

Even though the big, exciting thing these days was the expedition moving toward Tau Ceti, there was still a lot of hard analysis work to be done on Mars, and Mars stations were no place for men who were of an imprudent turn of personality. There were, in fact, *no* imprudent men on Mars. Actually, that was not really the case. No imprudent men on Mars? Well—none alive.

Though Stevenson certainly didn't think of himself as an imprudent man, Bren Bedraian wouldn't have agreed on the concept. He made no bones about his feelings that Dwight Stevenson was an imprudent man. Otherwise, why would Stevenson insist on "wasting time and sweat," as Bedraian put it, cutting a core grid out on the Pieplate? The two of them had gone over that argument yet another time at the beginning of this shift.

"God *damn* it!" Bedraian threw down the sheaf of printout, planted his fists on his hips and glared out through the window. "He's cut around the tower and is going over the Pieplate, again. God *damn* it!" Bedraian was talking to the window of his office, set into the side of the main pod.

"Leave him alone, Bren," said Doc Thayer. The M.D. of the station didn't even look up from the bio-analyzer printout he was studying. "You know he'll make up the time and still complete his program for the shift, so why quibble if he's got a pet project and wants to slip out onto the Pieplate to cut some more core samples? It's not like he was sneaking around behind your back, is it? You're standing right there watching him."

"That's not the point, Doc, and you know it." Bedraian bent over the desk and re-arranged the printout he had thrown there in disgust. "*I'm* the project engineer. Right?"

"Ummm," Doc Thayer nodded, still scanning his own sheaf of analysis papers.

"Top of my class; efficiency rating of 4.8; pulled Luna Alpha out of the fire when they were going to close it down." Bedraian grumped, half to himself, as he turned away from the window. "And, what do they do for me—me with a set of records and ratings that most xenology



The Tower was a landmark, but there was no sign the mark had been made by man, or anything else, for life had never even existed on Mars.

team chiefs don't have? They stick me out here! Mars Tower Station. Little archeology pits. Big discovery time. Look, Harvey—a piece of sedimentary rock! That's a big day at Tower Station."

"Ummmm," replied Doc Thayer. "Maybe they figured you should have a rest for a while. Give you team chief at a quiet station that's easy to operate. Take things as they come, Bren. You'll live longer."

"God *damn* it!" Bedraian waved the printout papers toward the window. "*This* cussed backwater isn't a rest for me. It's not what I worked my butt off to achieve. I should be on the prelim survey team of the Tau Ceti opening. *That's* what I worked hard to earn—and I earned it, Doc. I *earned* it."

Doc Thayer put down his paperwork and looked up at Bedraian. "Well, don't light into me about it, Bren. *I* don't make the postings. As you might appreciate, I don't really consider Tower Station to be the challenge of my life, medically or otherwise. But, I'm willing to sit back and skate for a while—gather my strength. Who knows what can of worms they'll throw at me next? Maybe something where I'll need every ounce of energy that I've saved up here at Tower Station. Don't let it get to you. Just relax and get the work out; being careful, of course, to put the pressure on your own boss for a more demanding assignment at every opportunity."

Bedraian laid down his paperwork. "Aw, hell, Doc. I'm sorry. I've just got to blow off once in a while or go batty. This place is so damned *quiet*. I cut every corner I can to crowd up the program, get it wound up—early if possible—so we can pull Tower Station out of here. So I can move on to something else. So what happens? *Stevenson!* He's got a little project of his own—cutting a grid of core samples on the Pieplate formation. It's not in the program. I've told him to forget it. I've flat, flogging forbidden him to work on it during programmed time."

"And, he doesn't give it programmed time, does he?" Doc asked.

"No," Bedraian replied wearily. "That's one of the things that's so damned maddening about it. I load heavier and heavier programming on him, right up to the legal limit in the regs—and that's far more than a normal man can perform—so he won't have time to tinker-butt around on the Pieplate. And, what happens? He still gets his work done, down to lab ahead of time, *and* he always comes back with a dozen more cores from the Pieplate, as well. Maddening."

"Well, what's the harm?" Doc asked matter-of-factly. "Stevenson is a quiet-as-a-mouse-in-the-corner kind of guy. Never says much. Never bothers anybody. Does his job—and does it bossgood. So, if spinning down cores from the Pieplate is his idea of recreation; let it be."

Bedraian sat down at his desk, hunched his shoulders, and began pulling notes from the printout for a sides analysis in the computer.

"Maddening!" he emphatically told his desk.

Tower Station, only one of many that dotted out over Mars, took its name from a thick pinnacle outcropping at the south edge of Syrtis Major. Visible for a great distance, the "tower" provided a fast, eyeball location of the station which had been set up close to its base for that reason. It was not that physical landmarks were needed by a research technician who was returning across the surface of Mars in a crawler; it was more a matter that men still felt comfortable about visual landmarks, because they had been using them to find their way home for thousands of years.

The squatty "tower" lay between its namesake Terran research station and a long, curved outcropping of conglomerate that the original crew had dubbed "The Pieplate." Someone had jokingly remarked that it looked like the edge of a disc that had been buried in the sands, but the idea of an ancient and weathered flying saucer stuck on Mars was too farfetched to hold water, even there in the middle of that desolate and corroded wasteland, so they had called it the Pieplate and the name stuck.

As his crawler crept across the formation, Stevenson watched the shifting pattern of wind-tattered vyathane flags that marked grid locations where he had already taken core samples of the Pieplate.

He looked back over his shoulder at the tower, and at Tower Station, which was slowly disappearing behind the broken rock of the talus slope at the base of the tower. When Stevenson had first seen the tower, he had thought for a brief, heart-leaping moment that it was the remnant of some construction made by a lost Martian culture, a civilization of intelligent animals much like man. If so, then a security lid had been slapped on the find, because no word of such archeological discoveries had reached Terra. Indeed, there were no official signs of life on Mars but simple vegetation. Still, archeologists—even working on Mars—would be inclined to keep *that* sort of astonishing information secret until the full implications of the find could be gathered together and some coherent theory about the dead Martian civilization could be formulated for publication by solid scientific authority. There would be news impact to consider as well. The taxpayers and the boards of university trustees who had to shell out the money for such projects as archeological research on Mars were in a constant state of gripe that the expenditures served no real purpose. A big, break of information, done with a decent amount of flash, to the effect that there had, at one time, been intelligent life on Mars, and that absolute scientific proof of that fact was now found, would quiet the dissent about spending appropriations for months—or even years—and insure a steady stream of funds to further the long, hard projects of research from such lonely outposts of pure science as Tower Station.

It wasn't true.

It was a pipedream. Something had leaped, full-grown, into Stevenson's imagination at his first sight of the tower. It was a hope as barren as the dreary blankness of the Martian landscape, a longing to find evidence of others that were like man but were not man which Stevenson knew wasn't going to happen.

The tower *looked* like a ruined tower, with age-old, regular striations that looked like worn joints in stonework, but which were crevices at the weak seams of stone that had been etched out by wind-blown sand over countless centuries. Deep inside himself, Stevenson had known it from the start. He had seen the same formations in the Mojave Desert when he worked on undergraduate digs—always hoping against hope to find some blockbuster of an artifact that everyone else had overlooked. Scattered across the high desert were enormous piles of stone that looked like armloads of giant building blocks discarded there by some playful godling—or, like stone fortresses that had crumbled and began to weather tens of thousands of years earlier.

They weren't. They were rockpiles that had been racked up when interstate expressways were built—stone junk that the freeway builders had pushed aside. They occurred nowhere else—not on the high plateaus, not in the open desert—nowhere.

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guidance tracks, all of those things combined made it visually something more than the sum of its parts. It was sculpture in itw own right. It was Art, following form, following function.

"What's wrong, Laura?" I asked into a silence that had been growing between us.

"I don't know, Matt. A combination, I guess." She shrugged her shoulders and made an effort to smile. "The publicity that the Project has been getting lately, its much different that it was just a few months ago. People here no longer know if they're heros or villians."

"Most people," I reassured her, "understand what's happening here, and they support the Project. There are always sophomoric philosophers, fanatics of one kind or another."

"It's more than just one faction," Laura said, refusing to let my own sophomoric words comfort her, "even more than just Jacob Desmond's Eastern Lighters. How could they have accumulated such a large following if there wasn't even a grain of sense in their arguments? Perhaps they're entirely right, more so than even they think."

"Laura," I said, "this isn't like you."

"I'm sorry, Matt. I guess I know that Dad's right. When it takes twenty years to send a message one way, it would be a terrible breach of faith not to include anything that might be helpful. Especially when. . . ." she hesitated and paused.

"When?" I prompted her.

"You'll be at tomorrow's press conference, won't you?" she said to change the subject. "I can't give you the details but there will be an important ancement on the Home Run Translation."

"Wouldn't miss it," I replied. "Besides," I continued truthfully, "my editors are probably wondering when I'm going to get around to filing a story again." She laughed.

It was a cold night and a strong wind was blowing away the afternoon clouds to leave a crisp, clear sky for the stars to glimmer from. As we talked under the towering mass of the Project antenna, the night sky became like a velvet backdrop to the glitter of the stars.

Laura shivered and moved closer to me. I placed my coat around her delicate shoulders and followed it there with my arm. I looked up past her at the stars. I wondered what they were doing that night on the fourth planet of HR 8832. They were a humanoid race. Matter of fact, they were supposedly identical to us physically, a fact that had made the



parallel evolutionists supremely happy and gratified. But no message, however long and well set up, could tell one race of beings exactly what went on within another race's collective head.

"I wonder," I said, "whether they can feel love?" There was no need to explain to Laura who it was I meant.

"That's not the problem, it is?" Laura said, "It's whether or not they can hate."

It was getting late and in a little while we drove back to the dorm.

The press conference was scheduled for early in the morning. When I awoke, I was surprised to find that Felix not only had returned later than I had the previous evening but had left even earlier in the morning.

I took one of the Project's tiny shuttlebuses from the dorm to the Admin Building. My credentials got me past another sour faced guard and admitted me to one of the building's smaller auditoriums. The seating capacity was about a hundred and a half and it became Standing Room Only just a few moments after I arrived there. The Press had shown up in force. They came from every nation in the expanded UN, and from a few others as well. The crowd mumbling noise was composed of every language. It was like listening to a tape of the crowd noises around the fallen Tower of Babel.

The curtain on the stage went up and silence descended. Four men walked from the stage wings to their seats along a blue velvet covered table.

Felix lead the line and after him was Professor Von Hecker. The third man's name I wasn't sure of, but I knew he was one of the people in the Bio section. The last man I had never seen before. He was dressed conservatively and wore the red and silver lodge pin of a UN official on his lapel. I figured him as a spokesman for UNACC, probably unimportant himself but with a message to convey from higher up. As it turned out I figured things right, but don't congratulate me on deductive reasoning. It was just the UN's usual way of doing things.

Felix wore a terribly worried look. In four years of rooming together at State I had never seen an expression like that on his face before. It didn't fit well there at all. It made new lines and wrinkles, and stretched the others out of shape.

Professor Von Hecker, the original good Doctor and father to Laura, looked tired. He looked very tired and very old. I hated to even think it but I couldn't help myself. He looked like a beaten, badly defeated man.

The guy from Bio, according to the program, was named Dr. Gangley. But neither his name nor the name of the spokesman for the UN Alien Contact Commission mattered much at all. They were both functionaries, doing what they had been told to do.

The UNACC functionary stood and made his statement. "The United Nations Alien Contact Commission," he said, "is pleased to announce that work on the translation of the interstellar communication from the fourth planet of HR 8832 is now complete. We are now proceeding to compose a return message. This message to," and he paused for a moment to express an ingratiating smile, "Home Run will contain many pertinent and, we hope, useful items from our own Earthly sciences. In composing this message we will be drawing heavily on the talents of our assembled Biologists, Chemists, Medical Doctors and Physicists as well as a leavening of Sociology and Philosophy. We are certain that everyone involved will give their best to help us succeed in this mighty endeavor."

If you're going to send messages to other races, who is to decide what should be in those messages, what information we're willing to give?

He reseated himself. The air was immediately filled with multi-lingual questions. Order was finally established in the hall. A Korean journalist asked the first question and a UN translator translated it for the people on stage and the audience.

"Well," Felix said replying to the question, "there most certainly have been differences of opinion as to what part of which sciences should be transmitted. For instance, how much of our signal should be spent on plant biology? Especially as the Homers are more advanced in that area. There are many, many decisions to be made as to the full contents of our reply."

Another journalist, an English speaking one, stood, "The question, Dr. Rice, was not in regard to Biology. To be absolutely specific, what parts of nuclear physics will be given to the Homers? All? None? Part?"

"Allow me, Dr. Rice." Professor Von Hecker's voice was thin with age but not weakened. He spoke in his capacity as Co-ordinating Chairman of the Project. "No decision," he said, "has yet been definitely reached as to any part of the message one way or another."

"Still," asked another reporter, "isn't it true that the Homers have no nuclear science of their own? And isn't the purpose of the Project to share all and any knowledge with the inhabitants of HR 8832?"

"The inhabitants," the Professor automatically corrected, "of the fourth planet of HR 8832. It is true," he continued, "that they have not yet developed any true nuclear theory. Their technological ability to receive and transmit interstellar radio waves has developed at a slightly different point in their history than it has in our own. They are, however, more advanced in some other areas than we are ourselves. It seems to balance.

The press seemed far from satisfied at the course the conference was taking.

"More advanced?" I didn't recognize the language the reporter's question was translated from. "I don't believe," the journalist's question continued, "this aspect has ever been mentioned before this time?"

"No, it hasn't." This time it was Dr. Von Hecker who answered. "We have only recently verified this after full and careful translation of the entirety of the so-called Home Run signal. However, Dr. Gangley would probably be the one with all the details."

Dr. Gangley smiled nervously. He cleared his throat, louder than he had likely intended to. He was obviously unused to speaking before anything larger than a conference table of colleagues.

"The Science of Biochemistry," Dr. Gangley said in an officious manner, "does seem to be slightly more advanced on the Homers' world than on our own. Most of their scientific advances are concerned with chemical reactions below the cellular level within the higher organisms such as Man. For instance, and most surprisingly, the Homers control lysosomic wastes as to buildup within. . . ." Dr. Gangley was interrupted at this point by Felix's calm, well-carrying

voice.

"Perhaps," Felix said, "it might be best if we should first take the time to explain a few basic concepts?"

"Of course," Dr. Gangley said, very much relieved to be taken from stage center, "go right ahead."

"First off," Felix said, "lysosomes are minute bodies contained within every cell of the body, with but a few exceptions. The lysosomes in turn contain digestive enzymes. These enzymes are needed by the cell in order to break down large protein molecules and membrane fragments in order to supply food to the energy producing parts of the cell. Dr. Gangley, would you like to continue?" Felix deferred to the other scientist.

"No, no. Go right ahead." Dr. Gangley was definitely adverse to speaking again.

"Well, then." Felix continued. "Each time that a lysosome acts to break up one of those large molecules or fragments a slight amount of residue is left within the lysosome itself. Over the years this residue continues to accumulate. The more residue which accumulates, the less the efficiency of the lysosome, the less efficient are the lysosome then the less energy can be utilized by the cell. It is this gradual process, along with others, which causes aging of the entire organism. The Homers," he paused for emphasis, "have sent us the techniques for what I might refer to as a lysosomic purge, a way to remove accumulated residue from the lysosomes of human cells."

It was a full five minutes before order could be restored to the shouting, excited crowd of reporters. It wasn't until Dr. Von Hecker threatened to cancel the remainder of the conference that a semblance of quietude was restored.

"Are you saying," asked the first journalist called on for a question, "that immortality is just around the corner?"

"Of course not!" Dr. Gangley was so horrified at the interpretation that he was startled out of his silence. "Perhaps human lifespans can be extended in this manner. But at best the expansion could be measured in years, a decade at most. Many, many other things contribute to the aging process besides the buildup of lysosomic residues."

The UNACC official spoke for the first time. "Ladies and Gentlemen of the media," he said, "I now thank you for this opportunity to present a few of the Project's findings. Our next conference will be scheduled as soon as possible."

While no one in the audience actually booed the man, no one cheered him either. It was plain that the media representatives didn't feel that the conference should end, not by a long shot.

I joined with the mob attempting to get backstage after the conference. With a bit of shoving and a lot of elbow work, getting myself sworn at in half a dozen languages, I did manage to get to the front of the crowd by the backstage entrance. More than a dozen UN cops felt, however, that the "No Admittance" sign on the door was self explanatory and included me as well as everyone else.

Luckily for me that "No Admittance" door opened for a moment and Laura who had seen my struggles whispered a few choice sentences to the chief cop. He flushed and then let me by after first reading every line of every page of my credentials. A few of the other members of the press and media seemed less than happy at my good fortune. But, after collecting my own share of elbowing, I was safe backstage.

"Matt," Professor Von Hecker smiled and shook my hand, "I have been wanting to talk with you ever since you first returned here. But it's been one thing after the other."

"Sure, I understand," I replied. "By the way, great news on the translating."

That may have been what I said but it definitely had nothing to do with what I thought. Because for people who were supposedly surfeit with good news they looked way too much like a funeral procession. Laura clung unhappily to her father's arm, Felix looked just as glum as he could force his round features to look, and the Professor looked to be in a different world altogether. Not to mention that the man from UNACC hung about like a dark cloud, casting an almost palpable gloom of security and secrecy over all.

It didn't seem the place nor time for a long discussion. Laura and I hurriedly arranged to meet later in the following day and I left, wondering what had gone wrong at the Project. I sensed that even the Eastern Lighters could not have accounted for the mood of tenseness and unhappiness that I had felt around me.

Once more I was awakened late at night, this time by a sight that caused me to rub the sleep out of my eyes in squinting disbelief.

The dim moonlight that filtered in through the bedroom window outlined Felix's large form scurrying about the room. He held a small metal box with an unlit lightbulb on top of it. He swept it back and forth in front of him like a prospector might use a metal detector. He motioned furiously at me, when he noticed my wakefulness, to keep my mouth shut. He needn't have wasted his energy. I was too astonished to speak anyway.

After a few more moments of his mysterious movements, after the box had been swept before every corner of the small room, Felix more or less threw himself into a chair by the foot of my bed.

"We're not bugged," he said with obvious relief. "At least, if we are, I can't detect the damn things. But I guess we'll have to take the chance." This last was said in a low voice as if to himself. Then, in a normal tone, "Matt, would you like to know what's going on around here? Before you answer, I can't guarantee that the information won't mean a lot of trouble for you personally. Maybe dangerously so."

I sat up in the bed. I have never pictured myself as the hero or even the adventurer type. The two months I had spent as a war correspondent, just prior to returning to cover the Project, had amply confirmed this self-image. Danger doesn't exhilarate me at all, it only makes me nervous.

"Alright, Felix. Go ahead and talk. What have I got to lose?" My only excuse is that it was late at night. My mouth must have been the first part of me to waken fully.

Felix looked relieved, as if my words had taken a great and oppresive weight off of his shoulders. I wondered what type of yoke I might have placed my own shoulders under.

"The United Nations Alien Contract Commission," he said, "has decided not to reply to the Home Run signal."

"What?" I have to admit that the idea had not occurred to me. "That sounds ridiculous. How could they so easily have given in to a cult, even if the cult does have as many members as the Eastern Light?"

"You misunderstand me, Matt." Felix drew in a deep breath, "I didn't say that we would neglect only to include information on nuclear physics in our reply. I said that we were not going to reply at all."

"But what about today's press conference?" Even as I asked I knew that it would not have been the first time that the press conference institution had been used to mislead rather than to inform.

"The only truth in the conference was that we have actually translated the Home Run signals. But it wasn't accomplished recently, but more than a month

But man can find a military use for almost any piece of information. A use making it easier to kill.

ago." Suddenly his voice took on a harsh and bitter tone, he sounded nothing like the good natured man he usually did. "The United Nation boys have even developed a few applications of the lysosomic purge."

"Isn't that good?" I asked unsurely. "Even if they haven't released the news of the applications yet?"

He was about to reply but the noise of the hallway door opening and shutting interrupted him. I must have looked as inquiring as I felt.

"Dr. Von Hecker," he explained, "with Laura."

"Has everybody got a key to my room?" I cursed and leaped out of bed to shrug my way into a bathrobe. "A man should get a bit of warning," I said, "before his fiancee and her father drop in on him." Felix smiled but I could see that his sense of humor was kept under heavy restraints.

Laura and her father knocked lightly on the bedroom door and Felix let them in.

"Hi, Matt." Laura seated herself next to me. I took her hand in my own. It was moist and I could feel the tenseness of her nervousness. I squeezed her hand, and she tightened her grip on my own hand. The Professor seated himself in the room's second chair. I saw that he carried a case for a portable projector.

"Has Felix finished explaining things to you?" Professor Von Hecker asked.

"He started to," I said, "but didn't get too far past telling me that some applications of the lysosomic purge have been worked out. That and the Project, for some reason, is not going to originate a reply to HR 8832."

"That's part of the general situation," Laura's father said sadly. "I have here," he motioned to the projector case, "a copy of a Top Secret UN film. I think you should see it."

It took him only a moment to set up the projector and its self–contained viewing screen.

The scene on the film was all too familiar to me. It showed a clearing in a jungle whose wet, rotting odor would remain in my memory until my dying day. A small camp of guerillas were in the foreground of the picture, three ill-clad regulars and an uniformed officer. The camera must have been hidden in the foliage just beyond their camp.

From the opposite side of the small clearing, out of sight of the soldiers, a viscous ball of reddish gas erupted from the trees. It rolled through the air towards the guerillas.

"The lysosomic gas," the Professor narrated for me, "is fired by a modified flame thrower. It has a range of approximately fifty yards."

However the gas was fired, it was a supremely silent delivery. The guerillas were completely unaware of the crimson cloud that swept forward onto them.

Just immediately after covering them, causing them to spring up in wild confusion, it dissipated.

"The gas," the Professor said, "can be timed so that any excess dissipates into inorganic components within a three second tolerance."

No effects of the gas were immediately apparent, other than that the guerillas were mightily shaken at having been taken by surprise, let alone by a surprise gas attack.

"Molecules of the gas," the Doctor continued, "are absorbed by the skin not only through surface adsorption but also by passing through the cellular interstices of the epidermal tissues. Once past the skin, the gas perfuses into every part of the organism and into every cell."

The guerillas seated themselves, one by one, on the wet ground. They rocked slowly back and forth in unconscious but strangely syncopated movements. They cradled their heads in their hands as if they were in the grip of a vast vertigo.

Laura sobbed. I felt her press her face hard against my shoulder. She had, I realized, seen the film before and now refused to look at it again. I wondered what would happen.

The camera, as if in answer to my thoughts, zoomed in on the face of the officer who now was laying with his back propped up against a tree. He was grimacing and beads of sweat glistened on his forehead. He retched. The camera mercilessly continued to film.

"While the technique of lysosomic purgation was meant to retard certain of the aging processes," the Professor said, "there are different, possible applications. One application is this harsh one, warfare by cellular destruction."

Tears came to the officer's eyes as his face tightened in horrible pain. He screamed. Though the film had no soundtrack I could imagine the sound of his cry. His mouth opened so wide in his agony that the muscles along the corners of his jaw quivered in tightness beneath his stretched skin.

Then, in a way more terrifying than I can readily communicate, his expression slackened. Only his eyes continued to scream as his flesh, bones and tendons could no longer support their own weight.

"In this type of application," the Professor said, "the walls of the lysosomes are destroyed. This degeneration takes place within every cell that the lysosomic purge gas has perfused to. The released digestive enzymes, from the sundered lysosomes, begin to break down the complex proteins that are the structure of the cell itself. In effect, each cell of the victim's body digests itself."

The scene was now one that Dante could not have imagined. Even now I still awaken some nights, sweating at the image that reappears within my nightmares.

As if hypnotized, I watched the man's flesh begin the slow process that, finally, would leave not even a corpse behind but only a large, viscous puddle of slime and fluids. I watched until his eyes liquefied and flowed down his cheeks. After that, I had to turn away.

I was sick afterwards. When I returned to the room the Professor had repacked the projector and the diabolical film. I sat back down next to Laura. Silence lay heavy in the room.

"I've heard a reliable rumor," Felix finally broke the silence, "that the UN is planning to wind down the Asian police action by the end of this month. By then, they estimate, the guerilla forces will have capitulated and the rebel government surrendered."

"They got," I suppressed a shudder, "*that* from the Homers? Maybe they shouldn't answer the signal. Who knows what in blazes they'd get in the mail the next time."

"You don't understand, Matt." The Professor's calm, reasoned voice restored a sense of humanity to the conversation. "What the Homers sent us is exactly what the UNACC boys had us say at yesterday's press conference. On the fourth world of HR 8832 the lysosomic purge is an everyday medical technique to increase individual lifespans. No military applications of the principle were included in the Home Run signal. In fact, no military applications were included in connection with any of the data."

"Not only that, Matt," Laura said softly, "but there are areas of scientific development that, according to the signal, the Homers seem more advanced than is our own technology."

"Much of it," Felix said, "is so abstruse, however, that no applications–peaceful or military–have yet to be worked out. UNACC does think that there might still be a lot more weapons to be had."

"Then why isn't UNACC running to send a signal?" I asked. "If what you

Eventually one man has to take the responsibiiity for any course of action taken by the group.

say is true they should be terribly anxious to hear from Home Run again."

"They're too scared for that." The Professor looked up at me. In his eyes I saw the look of a man who has watched his life's work taken away from him and then twisted down pathways he had never foreseen. "The UN feels that they must now operate on the principle that the Homers may someday invade." I am positive that I looked as incredulous as I felt at those words.

"I know," Dr. Von Hecker agreed, "it does sound terribly ridiculous. But it is just vaguely possible, not feasible, but possible. HR 8832 is one of the nearest stars, just twenty one light years away. The lifespan of the Homers is approximately three times that of a human. Their physical sciences, with the notable exception of nuclear theory, are almost on a par with our own. You know," he paused and in an almost pitying voice he continued, "I have even heard a UNACC man refer to the Hydrogen Bomb as 'our ace in the hole.'"

"Originally," Felix said, "the UN planned on answering the Homers but withholding any nuclear theory."

"That sounds suspiciously like the Eastern Lighters," I said.

"True," Felix answered me, "very much true. There is a very little known fact that Jacob Desmond before founding the Eastern Light movement was a minor functionary within the bureaucracy of the UN."

"Then why," I asked, "does the UN suddenly decide that no signal, even one that doesn't include nuclear theory, can be originated from Earth? It seems to me that, if what you imply is true, they went to a lot of trouble to mold public opinion in a certain manner. Why change now?"

"Because they are scared," Felix said. "The lysosomic gas scares even its users. At first they just didn't want to give the Homers anything that might later be used against our own world. Now, they would rather that the Homers not even know for sure that the Earth is inhabited. The Home Run signal was sent blindly to probably dozens of possibly life-possessing stars. If we don't answer then the Homers will be likely to write off Sol as having no inhabited worlds."

"But the thing is," Laura said, "there has been absolutely not one shred of evidence, or even a hint, that the Homers are warlike in any way at all."

"Another point," Laura said, "and the most important one is that the Homers are desperately in need of help from us according to the translation of their signal. They have used nearly all of their resources. They are a technological civilization undergoing the throes of power bankruptcy. Do you have any idea of why they sent the signal in the first place, dozens of signals identical to the one we intercepted?"

"I think," I said, "that I'm beginning to suspect but fill me in anyhow."

"The first part of their signal," the Professor said, "is a plea for help, a request for any information concerning sources of power other than fossilized fuels. They need help. They need nuclear energy."

"And," Laura said, her voice low and nearly comic book conspirational, "we are going to give it to them."

"Now wait a minute," I said, confused by all the new and conflicting information, "you say that UNACC is worried over nothing. But how can you be sure? Isn't it just possible that they're right, that the Homers are inimical?"

"We've told you our own feelings," Felix said, "and we think we're right. We know the Homers need our nuclear theory. Without it their civilization will die, that's a fact too. How can you weigh a fact like that one against a lot of scared maybes?"

Something about his tone of voice shocked me into a recognition that this middle of the night dialogue was meant to lead up to some sort of action. I wondered what it was that they expected of me. I wondered how I could ask without it seeming that I didn't want to help. But, for that matter, did I want to help? I wasn't even sure what that help would entail.

"It's like this, Matt." Felix sensed my mood. "We have a plan of action that calls for four people, we need you for the fourth. If you want to give us a hand, we have to begin now. If you don't, well, then we'd better leave and start looking for someone else."

There wasn't much I could say, not even that they had yet to explain their plan. They were people who I respected, one of them I loved.

"Alright," I said resignedly, "I'm in." Laura clung even tighter to my arm. A big grin creased Felix's face. Even the professor was on the verge of smiling.

"Come on," Felix stood. "Let's go."

The four of us rushed out of the dorm and into Laura's small floater car. On our way to the blockhoused Transmitter that was situated directly beneath the primary antenna, Laura breathlessly explained the plan and my own part in it.

Only four people were needed to operate the transmission mode of the giant antenna. It seemed fantastic but if the designer of the system said so, then four people should be enough.

Felix would tape the message itself, in the binary code the Homers had used for their own signal. While he taped, Doctor Von Hecker would adjust the antenna's orientation towards HR 8832. This adjustment was so critical that a team of scientists usually handled it. But the antenna had been the Professor's brainchild and he was confident that he could handle it alone. Laura would keep her beautiful eyes on the metered power supplies and transmitting stages. If anything drastic went wrong there would be little she could do, but she would be capable of making any small, detail admitter blockhouse.

Felix sat me down in front of a large console in a tiny alcove off to one side of the main room. He pointed to a small slot in the metal panel.

"Forget the blinking lights," he said, "and don't fool with the switches. Just worry about fitting the notched end of the tape into there." He slapped me on the back, Laura smiled at me, and then they both disappeared around the corner into the main room where the Professor was already at work.

I heard the typewriter like clacking of the encoding machine as Felix began his part in the operation. I could imagine Laura watching the slow, steady swinging of the instrument needles she monitored. I thought of the Professor laboriously figuring hour angles, declinations, precessions, making sure that once the message left the antenna it would arrive at the right point in space.

After about twenty minutes the noise of the taping machine abruptly halted. For a moment I heard the tiny whine of the antenna motors moving the dish a small but significant degree.

Laura came into my alcove and handed me the encoded tape. She smiled but hurried back to the main room to attend to the monitoring of the instrument readouts.
justments.

I would have the dummy's job. I would feed the coded tape into a small slot which would automatically activate the transmission. If the console had not been situated in a separate alcove, they wouldn't have needed me.

At first, everything went well. As we were not suspected saboteurs, at least as far as the guard knew, the Professor's credentials got us into the small trans-

Chained to the rock of time, he could only await the answer from the stars.

I glanced at the tape to find the notched end and was about to feed it into the slot on the console panel.

Then, with a noise so sudden that it startled me into dropping the tape, the door to the blockhouse was flung open. I heard Laura's gasp and a curse from Felix.

"Hold it." That voice could only have belonged to the UNACC man from the press conference. "I do have a gun and I am authorized to use it if needed."

I froze, although the walls of the alcove hid me from the view of anyone in the main room.

"How did you find out?" The Professor's voice was a monotone of defeat.

"Electronic surveillance is not the only method of overhearing a conversation," the UNACC man said. "A laser beam was trained on the window of Mr. Matthew Bennett's room earlier tonight in order to satisfy our curiosity as to his midnight entourage of callers."

"Of course." Felix's voice sounded bitterly self-accusatory. "The vibrations of our speaking would cause sympathetic vibrations in the glass of the window pane. That would modulate the laser beam."

The UNACC man ignored his comment.

"At least," the UN man's cold voice said, "we were able to stop you before any real harm was done."

"What harm?" Laura's voice sounded on the ragged edge of hysteria. "You can't seriously believe that the Homers pose any kind of invasion threat. My God, they're twenty-one light years away!"

"Well Miss," The UN man's voice was honeyed with sarcasm, "there are some who would disagree with you. Besides what gives you the right to go and give these peaceful Homers of yours a way to kill themselves all off? Why, it's just dumb luck that mankind only used the bomb once."

"What are you?" I heard Felix ask, "An Eastern Lighter? Why not shave your head? Afraid the point will show?"

"Alright, enough of that." Felix's jibe had destroyed the almost bantering mood of the UNACC agent. "Line up by the wall. Back away slowly from those instruments. By the way," he paused, "There are only three of you, here. Where's Mr. Bennett?"

I looked down at the tape I held. I could almost hear telepathic messages from Laura, Felix and the Doctor telling me to hurry up and get to work while I still could. But I hesitated.

Suddenly, I felt truly involved in the scheme for the first time. Before this I had been willing to trust to their knowledge, their judgement, their decisions. But now it was all up to me.

Along the edge of the tape the encoding machine had printed out a clear copy of what the message read. Most of it was equations that I did not have the learning to comprehend. One of the equations had, however, moved beyond the realm of higher mathematics and into the consciousness of folk lore.

$E = MC^2$ popped up at me from out of a mass of similar but obtruse sets of letters and numbers.

I started to feed the end of the tape into the slot of the console . . . and then I stopped.

I started to wonder what this action might result in. I did dismiss the threat of interstellar invasion almost at once. That worry seemed so contrived to fit the bureaucratic mind that I immediately dismissed it as a ludicrous red herring.

But there were two things I couldn't get out of my mind. The Eastern Light movement and the film I had seen earlier that night.

It was general knowledge that the Homers did not have a nuclear science. But it was not publicly known that their civilization's very survival might hinge on obtaining one.

According to the precepts of the Eastern Lighters I would, once I sent the tape, probably be responsible for a holocaust of nuclear war on the Homer's planet. The fact that the UN was the benefactor of the Eastern Light didn't really change things. For unless there was a grain of truth in their arguments, all the money in the world would not have accounted for the masses of people they had been able to attract. Did an advance in technology have to lead, invariably, to an advance in warfare? Did unchecked technology lead to unchecked destruction?

I closed my eyes. I could see the death grimace of that nameless soldier just as if I were still viewing that terrible film.

On our own planet a new technological advance *had* been turned directly to war.

But perhaps the Homers would have been disgusted at our use of a technique they thought of as being only a medically beneficial one. But then again perhaps they knew it could be a weapon also, and sometimes used it as such.

There was no way to know for sure.

"Is there another room?" The harsh voice of the UNACC agent broke into my thoughts. No one answered him but I heard him walking slowly towards the corner of the main room that led into the alcove. I knew that I would be momentarily discovered. There was no time left to think things through any further than I had.

I fed the tape into the slot. Immediately, at the speed of light, at a wavelength of twenty-one centimeters, our knowledge of nuclear physics was beamed outwards to the waiting stars.

"Get away from there!" Then came a noice like a cannon being fired a foot from my ear. I jumped involuntarily and for a moment thought I had been shot.

But I saw that the UNACC man had aimed past me at the console. The metal panels were broken and the wiring sparked with short circuits. But the tape had passed entirely through the mechanism. I had decided just in time.

Laura looked a question at me. I smiled and nodded my head. She smiled back at me.

The United Nations man fired again into the sparking console. his face was a mask of fear.

"It's too late," Felix said brusquely. "unless you'd like to try shooting down radio waves."

The UN man snarled and whirled about. I caught a glimpse of his face, he wore the features of a man who was literally terrified beyond the point of sanity. He fired the gun. Before I could even comprehend his action, Felix lay dead on the white tiles of the floor.

The United Nations formally apologized to Felix's family and the agent was removed from duty. But nothing would bring that giant, friendly man back to life again.

We all miss him, Laura, the Professor and I. But I miss him the most.

It will be forty years before we can hear from HR 8832 again and it is one long, long wait.

On some nights when the air is crisp and clear I search the stars for an answer that may never come. Once in a while I have nightmares of mushroom clouds exploding over cities that were never built by Man. I dream the sounds of screams in alien tongues.

I wish that Felix were around. He'd tell me that my choice was right, my fears completely baseless. But could I bring myself to believe him? No, I don't think so.

I can only wait for an answer that may never arrive. Wait and pray. Wait and hope.

Like Prometheus I am chained to a rock of Time.

I can only await an answer from the stars. O

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TWO OVER MARS

from page 55

and orbit-out burn accuracy were outstanding. However, for a number of reasons, the number two ship didn't make its course correction burn until it was 12 days out. It proved to be as successful as my burn, though, and both of us were on trajectory to our appointed niches above Mars.

With both our spacecraft now falling ballistically and inexorably around the sun towards our planned rendezvous with Mars, it would seem the mission would take on a purely routine status, at least until we were in the area of Mars. That's what the flight plan said, anyway. But, as on any mission, there are always surprises.

The first surprise in flight had to do with the radios. When the ranging channel was on, the radio subsystem tried to lock up on itself, rather than on the tracking signal transmitted up from the ground. With this happening there was no way I could have communications with Earth as long as the ranging system was on. Ranging is a form of two-way communication between the spacecraft and Earth in which a radio channel is devoted exclusively to navigation. A code pattern is transmitted to the spacecraft, then turned around and sent back to Earth. The time delay from departure to return is a measure of the spacecraft's distance from the transmitter, accurate to a few yards.

We tried several things, but nothing seemed to have any affect on the malfunctioning radio. Finally we cured the problem simply by turning the ranging system off. This left doppler tracking for range measurements, and I had communication with the ground. Later in the mission we turned the ranging channel on again for a test, and it was trouble-free. Whoever the gremlin was, he had left.

There were other surprises, but by June most of them were behind us. It was time to test our equipment, ready our programs, finalize our schedules. We were nearing the highpoint of the mission, the frantic week of activity we had been sent all this way to accomplish.

Our week near Mars started, for me, 154 days after launch, with Mars still some three-quarters of a million miles away. I turned on the scientific instruments, moved the scan platform to make sure it hadn't frozen on the long voyage out from the sun, then locked it in on Mars. Once the narrow-angle TV camera was warmed up I began the sequence of 33 pictures which were to be taken at 37 minute intervals.

Much of the information my spacecraft's sensors was taking in was being recorded, but a few hours after warming up the TV camera I turned on the high-rate telemetry link to Earth to allow the return of "live" material, which was not being recorded. What I was sending, from that far out, was a rough "engineering" picture of Mars, with most of the planet being blotted out by a black vertical stripe, set aside from the picture format for the transmission of ultraviolet and infrared measurements which were being processed by a special computer on the ground.

Through that night and the next day I continued taking pictures, and storing them on tape, as well as sending further bursts of live high-rate telemetry whenever the deep space network tracking station at Goldstone, California, was in line-of-sight.

From Mars Earth was but a bright star in the sky, but it was the home his mission had started from.

Two days after the picture taking started the tapes in my storage bay were full, and, on command, those tapes began to play back through the transmitter, headed for Earth. I started sending while I was still some 450,000 miles from Mars, and by the time I had sent all the pictures and information and erased the tapes I was within 350,000 miles. Time was getting tight. I again started taking and taping pictures for later transmission, but at the same time most of my attention was on getting ready for the actual pass over Mars.

Just as I was taking the last of my long-range pictures the board showing the status of my brother-ship, behind me in orbit, went wild. Within seconds all transmissions stopped.

Later we found out the stabilization platform had gone wild, and the ship was tumbling through space. The antenna, which had to be aimed very precisely at Earth, was still working fine, but it was no longer pointing in

even remotely the right direction. Finally it was decided to switch everything going out of the ship to the omnidirectional antenna, which meant that the signal would be a lot weaker, but at least the ship was back in touch with Earth, and the computations begun which would eventually put it back on course. Twice more the signal was lost, but the loss was not so critical, especially since everyone knew what was happening, and eventually the spacecraft was restabilized.

In the meantime I was sweeping across the face of Mars, doing the job I had been sent to do, but virtually ignored by Earth as they watched the problem and solution unfolding on the ship behind me.

I was sending out plenty of good data, but there was one slight hitch, and one I could do nothing about. One of the two detectors of the infrared spectrometer was not functioning. It was designed to operate at 400 degrees zero F., and part of the two-stage liquid gas refrigerator had failed.

However, five of the sensors my ship was equipped with were scanning the surface of Mars as I swept over Meridiani Sinus and Sabaeus Sinus. Then, with the TV cameras off, I headed over the darkside and in minutes I had lost all contact with Earth.

During that period I was busy switching circuits for a telemetry-play to Earth as soon as I came out of radio shadow. I had made my flyby, and as the recorders sent their load of information back to Earth attention turned to the troubled ship behind me.

The whole story of what happened on my brother-ship will probably never be told. Some of it will undoubtedly never be known. But there are some things we were able to find out after things settled down a bit.

Reconstructing things later, it appears everything started with an electrical breakdown which built up enough pressure to burst part of the battery case, spraying electrolyte from one or more of the eighteen silver-zinc cells. Some of the terminals in the spacecraft carry very high voltages, and it is likely that there was a regular thunderstorm inside the spacecraft, with a rain of battery acid and lightning from shorted electrical contacts. It was that storm which sent the ship whirling through space. And another storm several hours later caused even more damage and permanently garbled

turn to page 82

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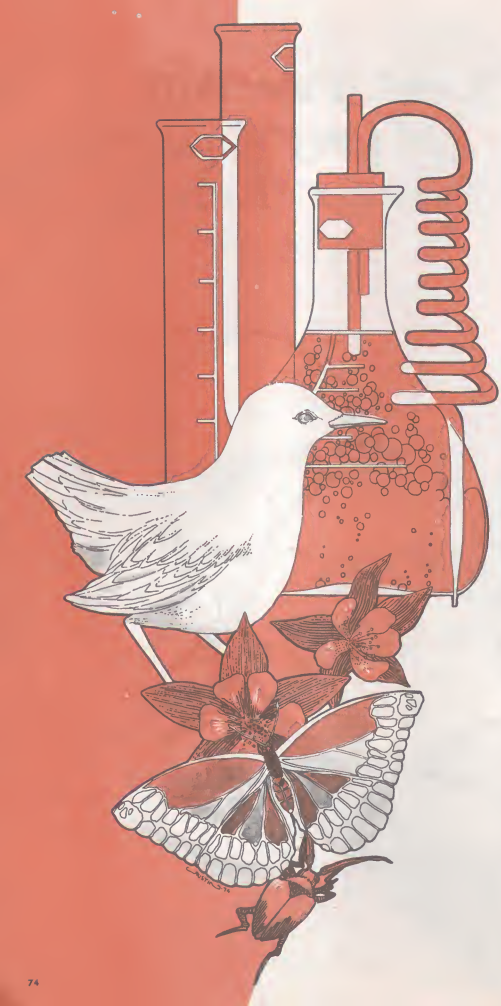
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Of Love, Free Will and Grey Squirrels On A Summer Evening

*fiction/***Stephen Goldin**
*artist/***Alicia Austin**





He first saw her at a party at her house. It was quite obviously an important affair; everyone in attendance was there in person, rather than sending projections of themselves. The fact that they were willing to travel physicallly to the asteroid showed the regard in which the Pistarchos family was held.

The assemblage was exotic. Heads of state mingled with entertainers, business magnates with culture heroes. Humans of all races, from nearly every settled planet. And there were aliens, too. Over in one corner, a bulbous Aalan was in animated conversation with a hermaphroditic CloBonner concerning ambisexual ethics. A Jezkini sat alone in his chair, his powerful musk driving away all potential human companions. Three tiny Laooo bunched together to one side, slightly terrified of being trampled by the crowds around them. Out on the terrace, where the cool night air was more bearable to him, an aged Fesserank was holding fort on intercultural marriages to an interested group of listeners.

But all these personages could not impress him, for once his eyes had chanced upon her, the rest of the party vanished from his sight.

She might have been just twenty years old, with the look of womanhood just settling into her features. Her hair was light brown, streaming rebelliously down her back. Her eyes were siphons, greedily sucking in all around her. Her nose and mouth were music in counterpoint, and her figure a triumph of symmetry. She wore a gown of gold and black that clung lovingly to her, exposing only a tantalizing glimpse of waist on her left side.

To say that he was attracted to her would be to say that space was black. But did he dare approach such a goddess? He sprayed himself a drink to bolster his courage and walked with feigned unconcern in her direction. She watched him approach, an unreadable expression in her eyes. She looked at him as though she knew everything about him, more than he knew himself. Her lips traced the faint outlines of a smile.

Her expression gave him the courage to speak. "Interesting party, don't you think?"

"I suppose so, if you enjoy this sort of thing."

Such *ennui* in a girl so young surprised him. "Don't you?"

She shook her head. "I've been to too many of them."

He was handling the conversation badly, he knew, but her nearness jumbled his thoughts. "Who are you?" he

She was everything he had ever dreamed of in a woman, and she was his. He couldn't understand why, but he wasn't fighting it.

blurted out.

"Nola Pistarchos."

The answer was so self-evident that he wondered why he'd had to ask. "Then this party is for you."

"Yes, it's my birthday. My father decided to celebrate it with a party, like they used to do centuries ago." Her smile broadened, and he basked in its warmth. "Are you enjoying *your*self?" she continued.

"Yes, now that I've met you." The words slipped out before he could stop them. He wondered what had prompted him to say that. She would probably think he was some naive young puppy in the throes of his first infatuation, and that was not the impression he wanted to give.

But her smile never wavered, and her eyes never left his face. Did he dare hope that her expression meant approval? "It's getting stuffy in here," she said. "Let's go outside and talk."

The eyes of the room were on him, wondering who the young man was chatting with the guest of honor. "All right," he replied. She offered her arm. After a slight hesitation, he took it and escorted her out onto the terrace.

They stood for a short while listening to the Fesserank expound, then wandered away on their own. It was cooler outside than in the house, but not uncomfortably so. The weather on this private asteroid was never allowed to fluctuate to any extreme, except on special occasions as a diversity. The sky was dark and illuminated only by the stars. In daytime, an artificial sun would have been shining, but there had been no need for a moon. Lanterns provided enough light for guests who wished to stroll about the estate.

They walked slowly into the garden, not speaking. The garden was laid out with geometrical precision, and all the vegetation was natural. Real grass grew in the ground, but not a blade of it intruded upon the walkway. Miniature evergreens came to an exact point. Flowerbeds were sown in bright colors and fanciful patterns, and hedges appeared in the exact spots needed to relieve the flatness. "This is a beautiful place," he marveled aloud. "The upkeep must be fantastic."

Nola shrugged. "It's not too bad. We have machines that do all the gardening, better and faster than a human could." She sighed. "We have machines to do almost *everything*." There seemed to be a trace of regret in her voice. He decided not to press the subject further, and searched around nervously for another topic.

"Do you spend much of your time on this world?" he asked.

"All of it," she said. "At least physically. Of course, I project myself around quite a bit—it's exciting to visit new sights all the time. But I do little physical travelling. I've visited several planets personally, and I've never cared much for the experience. They're always too hot or too cold or too wet or too dry. They're dirty and noisy and crowded and they smell terrible. No, I much prefer staying here on our own little rock, where I can be comfortable."

"Isn't it boring, though?"

"Oh no, not at all. We've got a complete world set up here, all ecologically balanced. We have a forest and a desert and a lake and a mountain, all natural and alive. Every once in a while, we even re-terraform the place so that it's a bit different. And as I said, I can always go projecting if things get tiresome here."

There was a false note in that speech, as though she were protesting too much. He let it pass.

They walked on a bit more without talking. She leaned against him, ostensibly for warmth. His mouth was going dry, while his palms were sweating. After a few minutes he dared to put his arm gently around her shoulders. She made no protest, and a short time afterward put her own arm around his waist. Her touch sent tingles through him. They walked on, enjoying the softness and warmth of each other's body.

Under a tree, they stopped. He looked down at her, she up at him. Somehow he found the boldness to kiss her, and her lips welcomed his with pliant willingness.

After some time, she told him she would have to go back to the house. The party *was* supposed to be for her, and she shouldn't be away from it too long. He nodded reluctantly, and they walked back through the perfect garden.

He was still dazed by the quickness of his success, and wondered when the bubble would burst. "Will I see you any more?" he asked suddenly as they reached the terrace.

She smiled back at him. "If you'd like. Why not drop by sometime? What about day after tomorrow? I could show you around the asteroid."

The thought of seeing her again stirred him more than he would have thought. "Fine. I'll be here." They rejoined the party and split up. Without Nola beside him, though, the atmosphere palled. She barely gave him another glance, so busy was she with the other guests. He left shortly thereafter.

Two days later, at midmorning, he came calling as she had requested. He was very much afraid that she would have forgotten about her invitation in the meantime or that she might not even remember him, and that he would stand in her hall embarrassed, trying to explain. But he came anyway.

The door opened automatically when he rang—it surprised him that he had been placed on the "admit" list, but it helped allay some of his fears. And there she was, waiting for him in the foyer, smiling. She was dressed more casually today than at the party, in a simple white blouse, navy blue shorts and knee-high suede boots. She was more beautiful even than he remembered.

"Hi," she said. "I'm glad you came. Feel adventurous today?"

He smiled nervously and nodded.

"Good. I had the robochef prepare us a picnic lunch. It'll be waiting for us down by the lake." She took his hand. "Come on, there's lots to see and not nearly enough time."

Outside, the artificial sun shone warmly upon them. It gave the pleasant effect of late spring, incipient summer. They got into a small electric cart and drove half a kilometer along a gravel road. The nurtured lawn and landscaping gave way gradually to rows of trees. They parked at the end of the road and set out on foot into the forest. The overhanging branches shaded them from direct sunlight, but a warm breeze kept them from feeling lonely. Occasionally, he could catch a glimpse of small animals darting about in the underbrush.

He pointed to some as they ran past. "Are they real or mechanical?" he asked.

"A combination of both," she replied. "We don't want purely mechanical things here, they're so sterile. On the other hand, real creatures are too unpredictable. We have android animals. They're made of living tissues, so they're actually alive, but we can program them to behave correctly. It's much neater that way. Watch."

She took a small plastic bag of nuts from her pants pocket, poured some of the contents into her hand and knelt down. Instantly, half a dozen large gray squirrels ran down the sides of nearby trees and approached her, showing no signs of timidity. They came straight over to her and allowed her to pet them as they took the treat from her open hand. "Ordinary squirrels might be hesitant,

His life on the asteroid with Nola was perfect. At least until he started asking too many questions, and got the wrong answers.

but we've programmed these so that they have no fear of us. We can play with them all we want." She picked up a squirrel, stroking its soft fur, and kissed its nose. The squirrel chittered angrily, but made no attempt to run away until she put it down again. Then it scampered indignantly up a tree.

She laughed as she stood up. "I love them, really I do. They're so cute and fun to play with. I come here by myself sometimes and spend an afternoon with them." She took his hand again. "Come on, I'll show you the lake. I'm starting to get hungry."

They continued through the forest. The trees became thicker, the underbrush a bit more tangled, but nowhere was the path impassable. Every square centimeter of ground was mapped precisely. Whoever the architect had been, he was most thorough in his planning.

The ground sloped downward slightly and the trees thinned out once more. Without warning, the forest ended and before them was a gravelly beach, the shore of the lake she had promised him. The water stretched for a kilometer across to the far shore, and was perfectly clear. The gentle breeze blew little ripples on its surface.

"Lake Nola," she said. "Daddy named it after me. Sometimes I come down here to go fishing."

"Programmed fish, too?"

"Of course," she smiled at him. "Less frustration that way. You're guaranteed to catch at least one in an afternoon." She spied a wooden table set up a short distance down the shore. "There's our lunch. Come on, I'll race you to it."

They ate lunch together, watching the designs the breeze made on the surface of the water. After the meal, they sat down on the shore. He studied her when he thought she wasn't watching, drinking in her loveliness.

"We used to live on Earth when I was very young," she told him. "Yes, the mother planet herself. I couldn't have been more than five or six. I'm told it used to be natural like this, but not any more. Too many people. Funny, but with all the people they have, you almost never meet anyone from Earth. Everybody I know seems to come from someplace else. I guess the Earth people don't travel much, any more.

"Anyway, we left it. My father had this asteroid built, and we moved here. We had to get away from all the crowds and the noise and the dirt. Daddy says that when you're rich and powerful they never leave you alone, so we made our own alone, right here on this rock. A completely self-contained world, he says, and he's right. We have everything here we could possibly need . . ."

Her voice trailed off and she gazed out across the lake in silence for a long minute. Then she looked at him guiltily and blushed. "I didn't mean to say those things, at least not that way. They sound almost as though I was dissatisfied, and I'm not. Not now. I've got everything I want." She rose and tugged at him to get to his feet. "Come on, let's take the boat and row across the lake. I still want to show you the desert before night."

There was a small wooden boat, just the right size for the two of them. He took the oars and rowed, while she stood in the prow of the boat and pretended to be a figurehead. He watched the breeze play with her long brown hair, catching one strand at a time and playing with it before dropping it for another. All the way across, he never took his eyes off her.

He marveled at his fortune in finding her. She was beautiful, rich, and seemed intelligent. Where were the scores of suitors she should have? Why was she spending time with him? He didn't know, but he vowed to enjoy every second of it.

At the other side of the lake, they went over a small hillock and confronted the desert. An expanse of flat ground stretched before them, mostly bare hard rock or loose, shifting, red and yellow sand. Boulders were strewn with apparent haphazardness across the ground, but the effect had probably been planned as thoroughly as the rest of the planetoid. An occasional clump of grass or a cactus broke the spell of dryness. Ordinarily, the horizon would appear very close on this small world, but the effect was forestalled by the mountain that rose on the other side of the desert.

She led him to her favorite spot, in the shade beside a large boulder. She showed him a family of beaded lizards that made its home in a crack in the rock and was not at all concerned about the invasion of the humans. Then she lay back and stared up at the blue of the sky. He lay back and did the same. After a while, he propped himself up on his elbows and looked down at her tanned and tawny body, so beautiful, so relaxed, so perfect.

"Nola," he said hesitantly.

"What?"

"I . . . I don't want you to misinterpret what I'm about to say. I'm sure you've heard it before, and it may sound sudden considering how short a time we've known each other, but . . . I love you."

She looked at him and smiled, and he felt the warmth flow in him. There was acceptance, assurance and mystery in her expression, a *knowing* of some secret he would never understand. "I love you too," she said.

She pulled him down on top of her and they kissed. The soft mounds of her breasts pressed against his chest, inflaming his passion further. They kissed and caressed ever more ardently, and undressed each other by silent mutual consent. They made love on the sand in the shade of the boulder. He was a spear inside her, an animal riding the lust she returned to him. Orgasm after orgasm ripped through her body, fueling his body still more. And when he himself climaxed, it was an explosion in which they both participated.

He lay on the sand beside her for a while, thinking he was completely exhausted. But in half an hour, they were at it again, better than before. And twice more after that. Their passions were superbly matched, their movements timed to perfection. Their bodies fit together so well it seemed as if they'd been created that way.

The man-made sun was lowering in the sky. "I think we'd better be heading back now," she said. "It gets dark quickly here." They dressed and left the desert, walking slowly, arms around each other's waist.

He called again three days later. She was waiting for him again in the foyer, this time wearing a flashy pants-dress of yellow and red. "Let's go projecting," she said after kissing him hello.

He smiled at her exuberance. "Where to?"

"Oh, anywhere. How about Rangazzi? I haven't been there for ages."

"I've never been there," he admitted.

"Great. Then Rangazzi it is."

They went upstairs to the projection booth she had in her bedroom and strapped themselves in. Nola set the coordinates and pressed the button. Instantly, their minds raced across the vast empty lightyears of space and emerged in semi-solid projection form on the planet Rangazzi, one of the most notable play spots of the Galaxy.

They went sightseeing first, as Nola whisked him all over the world. They saw ruins of an unknown galactic race, towers that rose thousands of meters above an otherwise flat plain and served no conceivable purpose. Nola told him knowledgably that those towers had been constructed roughly when Earth

was undergoing its first Ice Age; he was duly impressed. They went under the ocean and marveled at the great transoceanic highway built on the seabed by the Rangazzians five hundred years ago to span the distance between their two major continents. They made a quick tour through the Rangazzi Interstellar Zoo, reputed to be the finest in the known Universe and having hundreds of creatures that no other zoo could boast. She took him to the casinoes and they watched every imaginable game of chance being played for all possible stakes, including the ultimate—life itself. Then they went to the fleshpots, and she laughed as he gaped at the acts that were performed in the guise of entertainment.

"I think you've worn out my sense of wonder for one day," he said.

"Then how about some shopping?"

"Lead on. I am your slave."

She took him to the fanciest shop on Rangazzi. The proprietor greeted Nola by name and welcomed her cordially; obviously she was a preferred customer here. She examined the most exotic and outlandish outfits in stock, laughing as her companion made faces when she asked for his opinion. She finally picked out one that he agreed was tolerable, a green and white lace dress that seemed cut in all the wrong places and would cling to her only by an act of will. She couldn't try it on, being only a projection, but her measurements were on record here and the proprietor promised to have the dress made up and sent to her at once.

From the fashion shop, they went to the bazaar. She spread a hand expansively at the rows of stalls and booths. "Now something for you," she said. "Pick anything you like."

They wandered through, examining the strange wares. More than half of the merchandise was totally unfamiliar to him, and the scores of novelties only dazzled his brain. Nola went over to one oddly phallic-looking sculpture, carved from a stone of ever-changing hue. "How about this?" she asked.

He took a look at the price tag and whistled. "That's way beyond my means."

"My treat."

He shook his head. "I can't let you go to such an expense for me."

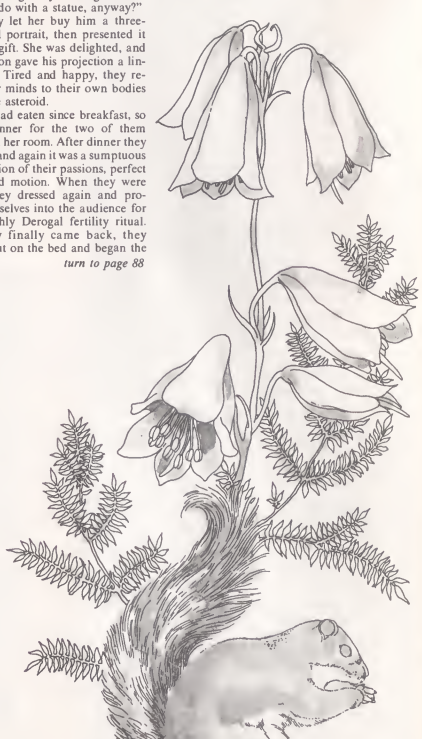
"Don't worry about it. I'm a Pistarchos, I can get anything I want." A sudden cloud changed her face. "Or almost anything," she said in a voice that was barely above a whisper.

The dark mood vanished in a second. She looked happily into his face and squeezed his hand. "Anything," she reiterated. "But I guess you're right; what would you do with a statue, anyway?"

He finally let her buy him a three-dimensional portrait, then presented it to her as a gift. She was delighted, and her projection gave his projection a lingering kiss. Tired and happy, they returned their minds to their own bodies back on the asteroid.

Neither had eaten since breakfast, so she had dinner for the two of them served up in her room. After dinner they made love, and again it was a sumptuous consummation of their passions, perfect in form and motion. When they were finished, they dressed again and projected themselves into the audience for the bimonthly Derogal fertility ritual. When they finally came back, they sprawled out on the bed and began the

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PINNACLE OF SUCCESS

from page 63

Still, Stevenson had loved to dream about what they *might* be, just as he had dreamed about what the tower *might* be.

It wasn't.

One of the first programs at Tower Station was to make extensive core tests of the outcropping, looking for signs of mortar joints, tool marks, anything that might indicate that the rock had been wrought into regular shapes, worked by some creature with some plan.

It wasn't.

Stevenson dismounted from the crawler, on the leeward side, and slapped the systems check boss on his pressure suit. Men did not breathe the air of Mars. Constant wind kept the tiny grains of sand in motion—enough to give a Terran terminal silicosis in record time. Stevenson moved with a deliberate quickness, methodically dropping out his grid triangles to mark the spots where he would take new cores. In less than an hour he had done his work, marked the new holes with little flagged length of wire, and had reloaded his equipment back into the crawler.

He hummed tunelessly to himself as he kicked the footlocks off and let the crawler go forward, arcing off at an angle from the Pieplate and proceeding toward the location of his assigned program to resume the slow work of exposing a facing trench. He would skip his breaks and his lunch period, and, if his programmed work went swiftly enough, he would stop on his way back and cut a few more cores from the Pieplate.

Laboriously, over a period of several months, Dwight Stevenson had cut cores in a ten-meter grid interval over most of the Pieplate and a stretch of its surroundings that measured nearly one thousand meters by two hundred seventy-five meters. Only a few dozen cores remained across the forward edge of the pattern and he would have completed it.

Nearly three thousand little lengths of geology were laid out in even rows near Tower Station.

Bedraian had refused, in a rather elaborate display of temper, to allow Stevenson's "nut project," as Bedraian had called it, to be shelved in the collection racks of the storage pod. Normally, core samples and other archeological items for a specific program of the project were tagged and stored until all the sample of that program had been gathered. Then, the technician would detail his data and run analyses on it, charting out the findings and conclusions.

Not so with Stevenson's Pieplate cores.

"Bullshit!" Bedraian had howled lustily. "It's not in the program! It's a damned *hobby!* Lay them out in rows—*outdoors.* Plant a garden of them, if you want, but get them out of my station!"

No matter. The weather wouldn't bother a great deal—not in the Martian atmosphere, and Stevenson made a point of sectioning out each core as soon as possible after he had collected it, patiently burning down the reps in the station's spectro-reader. If something particularly interesting cropped up, as it did from time to time, he could retrieve the sample from outside Tower Station and run further tests of it in the chem-analyzer and the Kallenberg densimeters.

Dwight Stevenson spent the first half of his shift exposing an additional section of facing at his program's trench site, carefully cutting along a surveyed line with the crawler and then digging out with the crawler. Four meter cut—deepen it to four meters deep. Four meter cut—deepen it to four meters deep. And so on, until forty-eight square meters of fresh rock and sand facing was exposed.

Climb out of the crawler. Check pressure suit systems. Carefully climb up into the crawler's bucket, snaking the air hose and the control umbilical along behind. Lift yourself to the top of the first cut. Clear the loose stuff with the air hose. Eyeball inspect it. Line it and tag it in half-meter squares. Haul out the Layer/Analog camera and record each square.

Then, move the crawler ahead four meters and do it all over, again.

At first, the work became extremely boring, because you never found anything—not on Mars. Once in a while a crusty lichen or a dried bit of moss. Rarely, an oddly shaped bit of stone that made your gaze dart quickly back to it and started adrenalin pumping into your blood—making the hair on the back of your neck stand up and your hands tingle. But, no; it was only that—an oddly shaped bit of stone.

After a while, though, you became so desperate to find something different or interesting—anything but the tiresome repetition of crumbled Martian geology—that not one grain of sand would escape your close scrutiny.

Dwight Stevenson was no different. If someone had buried a single straight pin in all the thousands of square meters of facing he had cataloged during his assignment at Tower Station, he would have been sure to find it. He was patient and thorough, always working with a steady speed of his own, but at the same time slowly enough to notice every tiny crystal of rock, every reddish-brown granule.

If he had found a sliver of dry bone or a little scrap of broken potshard, he would have shouted with hysterical joy. A petrified ant would have filled him with delight.

Of such patient stuff are good archeologists made. And, Dwight Stevenson was a good archeologist.

But, there was nothing.

At the end of shift, Stevenson carefully stowed his data and started the crawler back toward Tower Station. He noted, with a slight smile, that his chrono indicated he had once again finished his shift program early—nearly an hour early. He would have time to cut back across the Pieplate and take some more cores.

He had just finished doing that and was threading the crawler through the knee-high forest of tagged holes when Bedraian shouted at him over his commo.

"God *damn* it! Stevenson, enough is enough. What the hell do you think you're going to find out there?"

Stevenson's eyebrows arched up in surprise. "Why, I don't know yet—all the data isn't in. Besides, I haven't graphed it as yet. What's the matter, chief?"

From his office window, Bedraian scowled across the Martian landscape, where he could see Stevenson's crawler coming past the tower.

"Maddening," Bedraian emphatically told the window.

Stevenson's crawler lurched slightly as a powerful gust of wind hit it, carrying along a cloud of yellow-brown sand, powder-fine and sharp, that momentarily blotted out his field of vision. There was a *bumpety-bump-bump* vibration that carried to him through the machine.

As soon as visibility returned, Stevenson looked out the rear bubble of the crawler and saw several of his cores laying scattered along the track trail behind. The wind had dislodged some of the Pieplate cores from the outside specimen rack.

Methodically, Stevenson stopped the crawler and got out on the leeward side, repeating the check of his pressure suit

which he performed on every such occasion. Leaving the crawler, he retraced its path and carefully gathered up the armload of core tubes, leaning into the wind that always rose from the east this time of the Martian day.

Returning to the crawler, Stevenson was hit by another gust of wind-driven sand, and instinctively turned his head away as he kept slogging toward the crawler. But, when he looked up, again, and could see around him, the crawler was farther away than it had been when the dust cloud hit him.

It was moving.

The footlocks had slipped when the gust hit the crawler, and it was moving off by itself, gathering speed, slewing toward the tower.

Stevenson carefully laid down the cores and loped after the unmanned crawler, slowly gaining on it. He had jumped aboard at the track housing and gotten inside by the time the crawler hit an outcrop of the tower. He had secured the inside hatch when the avalanche of rock dislodged by the impact buried the crawler.

Dwight Stevenson twisted the corner of his mouth downward. He was in no danger—at least none that was immediate—but the crawler was buried under several tons of large, loose stones that had broken off the slope of the tower.

Patiently, he began working the controls—trying to back the machine out into the open. Various combinations of force moved him about some, but not enough to break free. The bucket wasn't strong enough to lift anything off the crawler, and there was too much rock to the rear to push out, even with the bucket and the tracks working together. Slewing sideways with one track and then the other slipped him across the rockpile a little, but it wasn't getting him loose.

Finally he had to raise Bedraian on the commo and tell him what had happened.

Bedraian, naturally, was furious. "God *damn* it! You can't get out by yourself?"

"No, chief. Can you send another crawler to dig me out?"

"Not for a while. As *usual,* you're the first one back, and my spare is down for maintenance repair. By the time we can get it together, someone else will have come in from another program site, anyway. How's your air?"

"Fine, I think," Stevenson replied. "I've got over three hours left if I go down to 'rest level' on recycling."

"Well," Bedraian grumped, "That should be plenty of time. Just sit tight, Stevenson. We'll get you out."

By the time Stevenson was back inside the station, ready to appear for a chewing out by Bedraian, it was already dark.

"God *damn* it!" Bedraian exploded. "All because of those *damned* cores from the Pieplate. I don't understand you, Stevenson; I just don't understand you."

"Pardon?" Stevenson asked politely.

Bedraian flopped down in the chair behind his desk. "Stevenson, you can put out more work than any two archeology techs I've got, here. I've got you on the maximum program load that the law permits—more than anyone is supposed to be able to perform on a per-shift basis—and you still wipe it out—and do a *damned* good job of it—with enough time left over to play around on the *damned* Pieplate. Why?" Bedraian slapped the top of the desk with the palm of his hand. "Why?" he repeated.

Stevenson looked surprised. "Semantics," muttered Stevenson. Then, more loudly. "Why, I'm interested in the Pieplate formation, chief. I don't see that there's any harm, as long as my work gets out, and everyone working on other programs is caught up. If someone else were behind—or needed help—why, I'd be glad to help—"

Bedraian gritted his teeth, making a grinding noise. "As you may appreciate, I, myself, am more than a little anxious to wind this project up as soon as possible, so we can get out of this hellhole. If you, Dwight Stevenson, who has it within his power, were to buckle down and concentrate on the project, itself, and forget about pie in the sky, we could likely get out of here six months ahead of schedule."

"But," Stevenson protested, "It's so *interesting.* You know," he said, warming to the subject, "The Pieplate is made of a different kind of conglomerate than most Martian rock. As the wind wears it away, the eroded granules blow to the west—the wind always *comes* from the east—and I can get readings on wind action without any muddling. The different rock of the Pieplate makes a clean deposit that's easily differentiated from surrounding formations. Why, it's like a dye marker. I don't know if there's another spot on the planet where we could get this kind of drift data. And there are other—"

"Oh, hell, Stevenson," Bedraian interrupted. "That's swell, and I appreciate what you mean. I can see how it's interesting as all hell, but it's not inside the *project.* It's not part of our *job* out here, and I just can't afford to consider things that aren't in the *project.*" Bedraian often felt that talking to Stevenson was like talking to a—well, it was a bad joke, but currently popular among research people—like talking to a man from Mars.

"I see," Stevenson mused. "You think I should volunteer for a heavier program load to help you finish the project you're in charge of sooner. I don't see—"

"Yes. Yes! My God, yes! Anything to finish the goddam assignment and get out of this goddam place. Now you're getting it. If you'll pull with me, instead of just skating along like you are doing, I'll gladly give you every scrap of the credit. 'Project dig at Tower Station completed *X* weeks early, due entirely to the extra work performed by Technician Stevenson.' Wouldn't look bad in your personnel records." Bedraian grinned. Maybe he was getting through at last.

"Well," Stevenson said softly, "That's certainly nice of you, chief. But, I've already got a lot of commendations like that in my records. I don't want to make anything hard on you. My goodness, I hope you don't think I'm just being obstinate. It's just that I'm so *interested* in the Pieplate. It's hard to describe, but there's something to it, and I just haven't put my finger on it, yet. That's why it's so fascinating—trying to fit all the little parts of the analysis together. Do you ever build ship models, chief?"

Bedraian pinched the bridge of his nose. "No," he said.

"Ummmm," Stevenson reflected. "I guess not, come to think of it. Well, if you take, say, two ship model kits, and one little plastic dinosaur skeleton; and put all the parts in a film bag with some loose computer circuit components—Uh, you shake them all up; see? Then, spread them out and begin to put them together—"

It was Bedraian's turn to say, "But, I don't see—"

"Well," Stevenson said quickly, "I do that and I find that I can build things that I could *never* have imagined to begin with. The Pieplate cores are much like that, you see. I *know* there's something there. I just don't know what it is, yet."

Bedraian shook his head. He didn't begin to understand it. "We're getting nowhere, Stevenson. We're trying to add apples and oranges. Look, I've got to suspend you until Maintenance has a

He found what he was looking for, what no one else could see. But then he had to convince the others it was there.

crawler for you to use."

"Oh, I'm sorry, chief."

"I am too. It's going to go into your record as negligent damage—because that's what it is. And, you'll lose a day or two on your program."

"Oh, I'll make that up," Stevenson said. "I don't want to be behind schedule."

"I'll bet you will, too," Bedraian said emphatically to his desk.

"In the meantime, I'll work on my chartings of the Pieplate cores." Stevenson was already thinking of something besides the conversation with his team chief.

"No you won't!" Bedraian snapped. "You'll bring the filing and sides analysis up to date on your program site."

"Oh, that's all caught up, chief," Stevenson said brightly.

"I'll bet it is," Bedraian said emphatically to his desk. "I just don't know about you, Stevenson. When I haul anyone else in my office for an ass-chewing, it comes off as an ass-chewing. When I haul you in for one, I get the impression that I'm talking to—well—skip it."

Dwight Stevenson stood, hands behind his back, looking out the window of the computer cubic. The pale sun was rising over the landscape of Mars, casting sharp, grotesque shadows in the thin air. From the compartment window, Stevenson watched the slow shift of light and dark over the tower and the ground to the west of it. He had been standing there for nearly an hour, now, with nothing much left to do until his crawler was repaired.

He had finished charting his Pieplate cores. He had dug up an unlikely collection of plastic scraps, odd worn-out parts of this and that, and built a model that looked like some alien machine that could have been a Barsoomian battle cruiser. He was idly thinking that he could go down to Maintenance section and help work on his crawler, but that idea didn't really appeal to him.

He was a man who was not used to being idle.

Out on the Pieplate, the morning sun glinted on metal and reflected a flash of light toward the station.

That was what he could do to pass another hour or so. Stevenson turned and walked deliberately toward the outage portal of the main pod. Once there, he carefully put on his assigned pressure suit and checked himself out of Tower Station.

Out on the Pieplate, he meandered across the formation, once again with his hands behind his back, stopping occasionally to scuff his toe against the rocky escarpment's surface. Something was there, in his mind—something that had been triggered by the flash of reflected light from the Pieplate. He had almost grasped what it was as he stood in the computer compartment and stared at the glint of light on metal, but it had gotten away from him as part of his conscious mind formed the idea of going out to the Pieplate on foot. The idea was still there, in his mind, but he couldn't quite close the hand of his consciousness around it and phrase it.

For a long time, Stevenson stood on the edge of the escarpment, where it rose sharply from the drifted, powdery sand, and watched the slow climb of the sun as it lifted above the horizon.

Slowly, he turned back across the Pieplate to where the cores still lay in a neat stack, reflecting light from their polished metal cylinders. Stevenson carefully scooped them up in an armload and started back for Tower Station.

Then, he veered off toward the tower. Might as well take a look, he thought. The cores had been forgotten in the bustle of getting him and his crawler out from under the avalanche at the tower.

Stevenson spent the better part of an hour, climbing carefully over the blocks of stone and tracing the patterns in the sedimentary rocks that formed the outcropping. Normally, there was only a dirty gray surface, but yesterday's accident had broken loose enough rock to expose granulated striations of freshly fractured sedimentary deposits, of which the tower was composed.

That was nothing new to Stevenson. The early core samples taken from the tower showed that information most clearly, and had also shown that the sedimentary stones in the tower outcropping had all come from the same location. As well, there was no evidence that the tower had been fabricated. It was just an outcropping.

Still, the patterns of stratification were what caught Stevenson's eye, and held his attention.

God *damn* it," said Bedraian. He stood, hands behind his back, glaring out the window of his office.

"Now what?" asked Doc Thayer, slightly annoyed that Bedraian's epithet had interrupted his discussion of medical evaluations just completed on the project staff at Tower Station.

Bedraian pointed out the window. "He's out there; *on foot*, this time." He grunted. "Stevenson, of course. Who else?"

"Oh?" Doc asked. "What's he doing?"

"How the hell should I know?" Bedraian said, without turning from the window. "He's climbing around on the tower. Liable to fall and bust his goddam leg, he is. That stuff is still loose from where he bent the crawler on it yesterday."

"Shall I send someone out after him?" Doc asked.

"Well, he shouldn't be out on foot by himself. Skip it, Doc. He's climbing down, now. Oops. Looks like he fell. No, no. He's picking something up in his arms."

The description was getting too complicated for Doc Thayer. He laid down his printouts and joined Bedraian at the window. "Wow," he said. "Look at him move!"

"Like something was after him," Bedraian agreed.

In less than half the time it had taken Stevenson to stroll out to the Pieplate, he was back inside the station, had gathered his charting and readout copies, and burst into Bedraian's office without knocking.

"They've been built by someone," he said breathlessly, but in a normal tone of voice.

Bedraian stared. "What?" he asked, as all-inclusively as possible.

"Why, the Pieplate, and the tower, of course."

"Bullshit," Bedraian said flatly. "There's never been any life on Mars that got past the level of educated moss, or we'd have found some evidence of it by now. There are one hundred and ninety-one stations like this one, and we've been doing research digs here, off and on, for over twenty years. Bullshit."

"Shut up," Stevenson explained. "Let me show you. I'm right. I *know* I'm right." Without waiting for approval, Stevenson began spreading charts on top of paperwork on Bedraian's desk and conference table.

"Look." He traced the graphs with his finger. "You see on the overlays. Following the curve of the exposed edge of the Pieplate, starting on the west edge of my grid and working toward the east side, there is a steady rise in calcium sulfate, then a sharp dropoff as we get to the high edge of the Pieplate. The same thing holds true for calcium carbonate. Oh, in much smaller percentage, to be sure. But, the ratio is *almost exact.*

The two plots are quite parallel. That's not the real clincher, but it's part of it."

Bedraian was prepared to suffer it through. "I may not be the geologist that you are, Stevenson, but, I am moved to say, so what?"

Stevenson looked blank. "Why, the calcium sulfate, of course. The only place you find an even distribution–like this one–of calcium sulfate–refined stuff, you see–is in poured concrete."

Bedraian and Doc Thayer looked at each other "Concrete?"

Stevenson clucked disapprovingly. "Calcium sulfate is the only thing that does a good job of binding sand and gravel together in a monolithic mass–uh–water vehicle, and all, to be sure. It's the principal compound in portland cement."

"Oh, bullshit," stormed Bedraian. "It occurs naturally, too, and you know it, Stevenson."

"I told you that was only part of it–" Stevenson began.

"Where'd they get the water?" Bedraian thrust his chin forward. "Huh? Where'd they get the water? There isn't enough water in the whole atmosphere of the planet to make that much concrete."

"I don't know that, yet, chief," Stevenson replied politely. "But, there *is* the Pieplate–out there–and it's made of a form of concrete. Something built it and used it for something. When we get it dug out, I'm sure we'll see, in the less severely weathered portions, that it was fabricated–constructed."

"Who built it, then? Huh? Who built it?"

Stevenson held up both hands. "I don't know that, yet, chief." He shook his head good-naturedly. "I only know that it was built. At this point, that's enough to go on–to start looking some more."

Bedraian flopped down in his chair. "That's *not* enough to go on, Stevenson. I hate to say it, but it's just *not*. Some smart young geologist could pick your theory to pieces in five minutes."

"Well, there is more," Stevenson apologized. "The tower is what made it drop into place–in my own mind."

"Hah! Now you're going to tell me that something built the tower; when we *know* that none of the rocks in it were ever worked, and that they're *all* exactly the same kind of soft sedimentaries composed of identical compounds."

"No, I'm not. What you say is perfectly true. That bothered me, too, until I looked at the fresh fracturing on the exposed faces, just now. You see, the cores that were taken from the tower all showed that–just what you've said–perfectly well. But, when the core cutter snaps off the core, the core sample always rotates just a little inside the tube."

"Go on." Doc Thayer was beginning to get interested, now.

"Well," Stevenson continued. "The *material* of the tower is all identical, but the whole formation isn't laid down at the same angle. The sedimentary layers are all at crazy angles to each other. With no evidence of water action, and no evidence–in this part of Mars–of volcanic activity, that has to mean that the tower is a rock pile that was deposited there as construction junk."

"Outlandish," snorted Bedraian.

"Well," Stevensonsaidcarefully, "That could be. But, I'll bet if you dig out under the Pieplate, looking for evidence of regular construction, you'll find that the rocks of the tower were hauled out of the way when the Pieplate was built and just stacked up where they are to get them out of the builders' road."

"Stevenson," Doc Thayer said gently. "There's just one thing you've overlooked."

"Yes?"

"I've gone over tons of data on the xenology of Mars. There is *no* exobiology on this planet, because nothing ever developed here of a higher life form than 'educated moss,' like Bren said earlier. If anything had, we'd sure as hell have found evidence of it by now. We haven't found a single bone, fang or fingernail of *any* higher life form, much less anything that could have developed a civilization capable of building concrete structures. There just aren't any fossils. There aren't any artifacts. There aren't even any *traces* of any animal life–neither fish nor fowl is there. Or, ever was there on Mars. And, much as I would like to believe you–God, would I like to believe you–you just can't make it hold water that something developed to this degree of engineering capability in such an isolated way that we wouldn't have uncovered indications of it by now. Evolution is a *long* process, and it leaves a lot of tracks. Nothing has ever evolved on Mars–certainly not your concrete builders."

Stevenson's eyes were wide and he smiled. "Oh, my goodness. I see I haven't made myself very clear. I never said they *evolved* here; only that they *built* here."

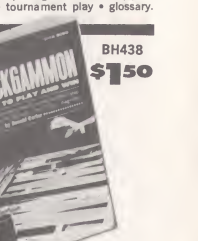
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TWO OVER MARS

from page 71

about 20 engineering measurements which were to be sent back to Earth.

While the ship was being steadied down for the Mars flyby, hoping that enough instrumentation was still operating to (a) get the ship straight, and (b) send back some useful data, scientists on Earth tried to figure out just what had happened — what had triggered the electrical breakdown. There was a meteorite theory, a two-meteorite theory, an inner-asteroid-belt theory, and even a Great Galactic Ghoul theory. Meanwhile, though, there was a job to do. Theories would have to wait for later, after the mission was over, one way or the other.

First thing, attitude control and power had to be checked, and in a hurry. Tests showed them to be functioning reasonably well, except that the telemetry channels for navigation and stbilization were dim, unreadable on Earth. But it appeared that the ship could be held on course, and during the actual flyby they could go to gyro control if necessary.

And, of course, the scientific instruments package had to be undamaged or the mission would be without meaning. But until they were turned on for final check, three days out from Mars, there could be no certainty. There didn't appear to be any damage, but there wasn't enough power to turn them on, check them out, turn them off, then turn them on again for the encounter. Either they would work, or they wouldn't and there was no way to tell which until they were actually needed.

When it was time to turn the instrument packages on everyone held their breath. And for the three days before flyby the backup ship took 93 photos of Mars, clearer than those I took, starting farther out and ending closer in. And the data sent back from the sensors, when combined with the data I had sent back, gave us our first real information on what Mars was like.

Once upon a time Mars was thought to be much like Earth. Then the scientists started comparing it with the Moon. But the data we sent back showed that it resembled neither Earth nor Moon. It was Mars, a distinct planet with features of its own.

It is a cold, dry desert world of many terrain types, clothed in a thin atmosphere of carbon dioxide which condenses into polar frost and snow and into thin, high-altitude dry-ice clouds under appropriate conditions. Terribly hostile to any kind of life that exists on Earth, Mars still could support its own rugged, unearthly organisms. That's a question the next mission will have to find the answer to.

Carbon dioxide and its dissociation products were found by our spectrometers to dominate the composition of Mars' atmosphere. Traces of water vapor and ice, and an assumed but undetected small quantity of inert gases such as neon and argon seem to complete the list of components of Mars' thin, cold air. A very high, extremely thin cloud of atomic hydrogen surrounds the outer atmosphere. Atomic oxygen, carbon monoxide and various ionized particles, presumably resulting from the breakdown of carbon dioxide by solar energy, were detected in the upper atmosphere by our instruments. To us the most striking features of the Martian air were the absenses. Nitrogen was not detected, nor were any of its compounds. Ozone, which is formed in a layer high in Earth's atmosphere and protects the surface from lethal dosages of ultraviolet, was also absent.

Space was cold and dark that far from the sun, but not so cold nor so dark he couldn't take it.

The clouds of Mars have a variety and character of their own. They are dry clouds composed of dry-ice crystals, ice crystals and dust. The commonest clouds were solid carbon dioxide, which on Mars is frozen air. The northern polar hood was probably of this composition as well.

Using two infrared radiation instruments, we measured the temperature at Mars' surface, and found it to be about 60 degrees above at the equator at midday, and 240 degrees below zero in the snowdrifts of the south pole.

Many of the classical Martian features, such as canals and the sharp borders of the seas, were not to be seen as we skimmed by the planet. But a new mystery appeared as we crossed over Hellas, a circular southern desert that changes to pink then white then pink again with the seasons. The western border was terraced with the now familiar and expected craters, but in the depressed floor of the crater there were first a few, then no craters at all for hundreds of miles. What it was that erased the craters, or protected that particular area from cratering, is yet to be determined.

Mission completed, our two spacecraft coasted out beyond Mars, our solar system relative speed of 50,000 miles per hour relatively undiminished by the gravity field of Mars.

Calculation of our flight paths continued, projecting into the future the positions and motions of our craft. Even with the primary mission completed we were busy, though, as the desire to probe the potential of our mission and possibly add some new information to what we had already made available prompted several scans of stars and a comet we came upon in visible, infrared and ultraviolet spectrums.

We would be directly opposite the Earth in orbit, the position called superior conjunction by astronomers, in late April and early May, having by that time passed through aphelion, our farthest point from the sun and started back towards the warmer regions. In September we would be only 65 million miles from Earth. And at that time I would still have power to perform certain experiments, although my backup ship, because of having to use maneuvering reserve in the disaster just before the flyby, would be simply drifting through space, essentially dead. As soon I would be dead.

But we would not have died in vain. For we had proved out a system of spacecraft adaptability which had brought to a successful conclusion a very complex planetary mission. Even as we left Mars behind and joined earlier craft which had ventured into deep space, Mariners and Pioneers and a host of other spacecraft as manmade planetoids in permanent solar orbit, they were busy back in the factories and laboratories of Earth designing the ship which would follow us out.

Though ours was probably the last mission of this kind, our two ships, collectively known as Mariner Mars 1969, turned a corner and made a new beginning. Like the rest of the interplanetary ships you have sent out, you will never see us again, but our cargo of scientific information is in port, safely returned from Mars.

"This is Mariner VI and Mariner VII — Goodbye." O

be some proof which says clear to everyone, "we have been here." The problem for the space visitors was what should they do with it, where should they deposit it? To just give it to a leader of that society, a high priest, would be wrong because they know that future generations will have wars and the winner of wars may destroy the temples and the libraries—the proof is gone. The only probability left is to deposit the proof on a logical mathematical point. Finally someone looks later—the space age generation.

VERTEX: How would you equate your theory to Darwin's Theory of Evolution?

VON DANIKEN: Charles Darwin's Theory of Evolution is right and I accept it—until the moment where we come to the question, why have we become intelligent? Here natural selection and evolution are definitely wrong.

VERTEX: Do you think that mankind was "programmed" to develop in a certain way?

VON DANIKEN: Yes, we are programmed. The program is to become intelligent. As soon as you are intelligent you have no alternative than to do a certain thing. To be intelligent means you always want to accumulate knowledge. You have no alternative but to go in one direction. That is the program—being intelligent.

VERTEX: Is the drug culture of today changing the program in any way?

VON DANIKEN: No, that would change nothing at all. If you take a drug and have a mind expansion, what does it change? When you are out of the drug, or even when you are with the drug, you want to know more and more.

VERTEX: According to the extraterrestial program, what is mankind's fate?

VON DANIKEN: The program is to develop space travel.

VERTEX: What is your view of the new groups being formed to investigate ancient astronauts?

VON DANIKEN: We have the Ancient Astronaut Society in Chicago, in Los Angeles we have the Terranautical Society, and in Toronto a Von Daniken Society has been established. They all research in the same direction: to prove or disprove this theory. It doesn't matter. They are looking for truth.

VERTEX: Thank you very much, Herr Von Daniken. O

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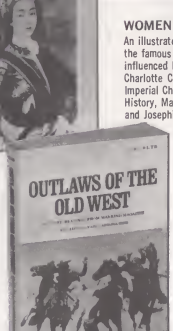
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TIME OF NEED

fiction/F. M. BUSBY
artist/ALICIA AUSTIN

It was only through total cooperation that either the earthwoman or the lost being could survive.

The Earthwoman needs me, and I her. If I had not found her, each of us would have died alone. But now her blood runs sweet in its cycle between us; I am nourished. In return, as with the *hlurin*, I sense the needs of that blood and feed into it the essences my body makes, lacking in the food she gathers here.

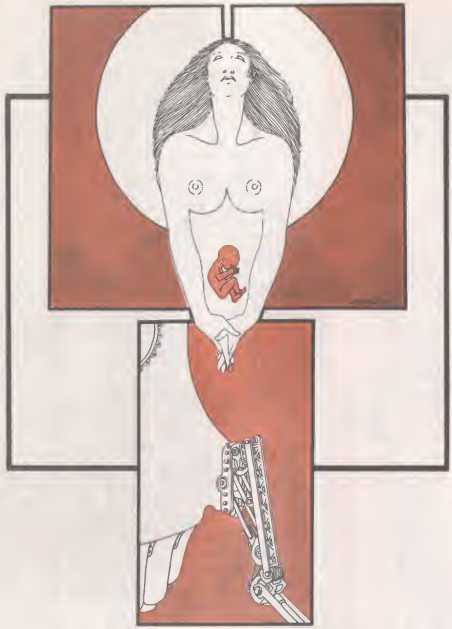
The filaments at the ends of my blood-tubes read her senses. They are stronger than mine and more vivid—more so, even, than those of a *hlurl*. Her awareness is much greater than theirs; it may be equal to my own.

I cannot follow her thoughts in detail; I receive only fragments of memory, concepts and intentions. And unlike the *hlurin*, she cannot receive my thoughts—or control-impulses. I can, of course, affect or block her senses.

Her picture of me is that of a short cloak hanging from her neck, rippling with iridescent color. The concept interests me: the *hlurin* have no such image of our kind. We are here, as they are, and they accept us.

When I found her, she was lying on the sand, with no use of her awareness. At first sight she looked much like an overgrown *hlurl* except for the coverings of her body, which I then thought to be a part of her. And her short fur—it is yellow—also leaves bare her face and limbs.

I was midway of a journey I had undertaken alone. I should have been safe enough, with days to spare before my fulfilled eggs brought forth the egglings.



They needed each other to live, but eventually they would have to decide who's need was greatest.

But suddenly my *hluri* weakened and died. I do not know why–it was young, and its blood came and went with good vigor.

So, perilously near starvation, I was creeping slowly in the only way we have, of ourselves, when I came to the Earth-woman. Thinking her to be a *hluri,* I was overjoyed, and moved faster against my weakness. But, no–she was something I had never seen. Still, perhaps. . .

The risk was great, but to avoid it was to die.

At first I thought the venture had failed, for her blood was sour and noxious. But I persisted, and soon, each giving to the other's need, our strengths returned. Her breath slowed and became deeper; she stirred, rolling onto her back–onto me. She is heavier than a *hluri* but the discomfort was minor. I waited, heeding the confusions of her awareness as it slept.

Late in that day she woke. Her eyes opened; the impact caught me unprepared–I was drowned in hues and brightnesses I had never known! Then came the burst of her awareness–trying to absorb its scope, I was paralyzed. The *hlurin* think of food, comfort and–in season–breeding; to know this new creature was like knowing one of ourselves, but directly rather than through vibrations. For a time I did not think, even, to try to take control in the normal fashion.

Though I could not evoke her thought at will nor choose what I would experience, I learned much, for her awareness was busy. I saw much that I did not, still do not, understand. She was from another place, called Earth, but where it is I do not know. She had been traveling high above the sand, through the air in some way not clear to me, and then had been unable to travel further. Moving on the sand for some days she had eaten all her own food, which in some way maintains her blood without need for one of us, and then had resorted to eating that which grows here. And she, as I, had come near to death.

When first she rose she did not notice me, for I hung behind her. When she did see me–or brushed me with her arm; I am not certain which first occurred–she stroked me with her fingers and seemed pleased. Then she felt our points of attachment at her neck; she made distressed sounds and tried to tear me away. She could not succeed, nor injure me: we are not fragile, though we may appear so. But for the first time I sought to exert control, to quiet her.

I could not; she did not seem to feel the impulses, let alone respond to them. Abandoning the effort, I tried to give to her my own thought and sense-impressions so she would know I was also aware. It was obvious that she received nothing; she pulled and tugged the harder, and made louder noises.

I could only wait, and eventually she calmed, realizing that no hurt had come to her. Then, also, came the thought that she had been near death and was restored–and what but myself could be responsible? I felt in her a sense of relief–mixed, I think, with the wish not to have pulled at me and made the noises.

She stood, walked about and fed upon the sparse growths around us. Then she gathered the things she carried with her–the *hlurin* do not carry things except under our control–and set out walking. I sensed her intention. It was to return to her own point of origin–Earth, I supposed, though the concept was confused–and rejoin others like herself.

Her course posed a problem. I sympathized with her wish to be with other Earthwomen–again there was confusion in the image I received–and also welcomed further contact between them and our own kind. The difficulty was that she was walking toward neither the origin of my journey nor its destination, but away from both. And before we left the areas I knew, I needed to add to our company a *hluri,* or preferably two. So, lacking direct control, I tried another way to turn her toward my original destination.

When I dimmed her vision on one side to turn her toward the other, she hesitated but continued movement. When

turn to page 90

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OF LOVE, FREE WILL AND GREY SQUIRRELS ON A SUMMER EVENING

from page 77

love-making in earnest, amid sighs, moans and mutual assurances of undying love. He spent the entire night with her, but little of it was devoted to sleep. They made love six–or was it seven?–times, each time more passionate and more perfect than the time before. He left the next morning after breakfast, exhausted, with a promise to call again in several days.

The next time he came, they climbed the mountain. The upward trek was strenuous but not dangerous; the planner of the asteroid had seen to that. There were solid and sufficient handholds all the way up, making the climb not so much one of skill as of endurance. Even with the artificial help, though, it took them the better part of the day. They brought packs with them, and when they reached the summit they celebrated with flower wine and *istarn* in the shell. They pitched a tent in the loosely-packed snow and spent the night curled up tightly together inside a heated sleeping bag, making love whenever the whim suited them. The next morning, they climbed back down again.

They spent his next few visits projecting themselves to the garden spots of the Galaxy. They saw sights too alien to be comprehensible and too beautiful to be alien. They met creatures that he would have thought physically impossible, and talked with beings who'd been old when amoebas first appeared in Earth's oceans. They spun around stars and laughed at comets. They cavorted naked on a red beach and made love under suns of every conceivable hue.

She laughed, and he laughed with her. Her smile was the Universe to him, and more. And always, wherever they went, there was her beautiful face before him, leading him on to new ecstasies.

The asteroid's spring had turned to summer. They had gone fishing on Lake Nola and he had, in jest, made a disparaging remark about the size of her latest catch. In mock anger she had pushed at him, and he'd pushed her back. She'd lost her balance and clung to the side of the boat, which promptly overturned, spilling them both into the water. They'd laughed, and she'd splashed him. He'd swum after her to the shore and caught her, dragging her down with him onto the warm gravel. They made love, wet and dripping, there on the beach, and when they were done they lay together, letting the warm breeze dry their bodies.

He looked down at her face, so beautiful, so alive. "I love you, Nola," he said.

She kissed the first two fingers of her right hand, touched them to his forehead and smiled. "I know you do."

"And I want to marry you," he continued.

Something changed at that moment. He could feel her body beneath him stiffen. The smile vanished from her face. The eyes that had been so languid took on new expression–something almost akin to fear.

"What's the matter?" he asked, worried. "Did I say something wrong?"

She turned her face away from him. "You're not suppo . . . Yes, something very wrong."

He stroked the hair beside her ears, trying to be as gentle as he could. "Is it so wrong to want to spend the rest of my life with you?"

She had regained a bit of her composure. She turned back to face him, and there was only a crystalline hint of tears in the corners of her eyes. "There's nothing wrong with that, no, but we can't get married."

"Why not?"

"Well . . ." She hesitated, groping for a reason. "We have such a beautiful relationship. I don't think we should ruin it by formalizing it, putting ourselves into a rigid pattern . . ."

He put on his most soothing expression, trying to reassure her. "But marriage wouldn't ruin anything–it would make our love grow and deepen . . ."

"My . . . my father wouldn't allow it."

"I know I'm not from the same high social class you are. But let me talk to your father, explain how we feel about each other . . ."

"You don't understand," she whispered hoarsely.

"Even if we can't convince him, we don't need his permission. You're old enough."

She closed her eyes and shook her head frantically. "You don't understand. You just don't understand."

He fought the rising sense of frustration. "I'm trying to, honest. If I don't understand, why don't you explain it to me?"

She pushed him away from her and got unsteadily to her feet, tugging up her skirt as she did so. "I can't! I *can't!*" She couldn't stop the tears that were flowing now.

He stood up beside her and tried to put an arm around her. "But . . ."

"Leave me alone!" she shrieked. She pulled away from him and ran off into the forest in the direction of the house. He stood alone on the shore for a long minute, wondering exactly what he'd done to offend her and debating whether he should go after her or not. He pulled up his pants and decided that he shouldn't leave her alone in such a distraught state; she might hurt herself running blindly through the forest like that. He started walking after her.

It took him but a minute to catch up with her. She was sitting by a tree, talking to someone on her wristphone. He could hear only her end of the conversation as he approached her.

". . . thing went wrong. He wants to *marry* me . . . How should I know, you're supposed to be the expert . . . But it was supposed to stay simple, he wasn't . . ." She broke off suddenly as she sensed his approach. She turned her head and saw him standing a few meters away. She clicked off her phone hastily.

"Have you taken to spying on me now?" she asked, hostility dripping from her voice.

"No. I just wanted to make sure you were all right."

She softened slightly. "Well, now that you see I am, you can leave."

"What's going on, Nola? What's the matter?"

She got to her feet, very defensive. "None of your goddamn business."

He grabbed her firmly by the shoulders. "You owe me an explanation!" It was the first time he'd ever raised his voice to her, and it surprised both of them.

"Why?" she asked defiantly.

"Because I love you, and you love me."

She looked him straight in the eye and said in a petulant voice, "I don't."

Her reply shocked him so much that he dropped his hands. They stared at one another for a second, then she tried to bolt again. He managed to grab her hand and pull her back. "I hate you," she spit at him.

"Tell me what's going on."

"I hate you, I hate you!"

"TELL ME!" His grip on her hand tightened.

She started crying again. "I can't. You won't like it."

"I'll decide that for myself. Tell me."

She sniffled back a few tears and stared down at her feet. "You're an android," she said.

He was so startled that he could think of nothing to say for a moment. Finally he said, "That's ridiculous."

"I told you you wouldn't like it."

He shook his head. "That's just too

ridiculous for words."

"Is it?" She looked up at him again. "What's your name?"

"What kind of a silly question is that?"

"A perfectly normal one. What's your name?"

"It's . . ." He hisitated, thinking.

"You don't have one," she went on. "In all the five weeks of your life, you've never had a name."

"Of course I do. Everyone does." But he couldn't think of it. Could he possibly have forgotten something as central as that?

"Where do you go when you leave me? Where do you live? What do you do when we're not together?"

He wanted to talk, but his mouth seemed paralyzed. Her questions were spinning round and round in his mind like vultures—ever-circling, never lighting. She was confusing him, he couldn't think straight. The answers were there, they had to be, but he couldn't find them. He needed a chance to think, to shore up his collapsing ego.

"When you're not with me, you go to a shack out in back of the house," she continued cruelly. "You live in a vat of nutrient solution. You spend all your time asleep until I want you."

His mind was a blank. Who was he? Where was he from? What did he do? No answers, only echoes. He searched his memory, but found only empty boxes where there should have been a life. He could remember nothing except the time he'd spent with her.

His knees were about to collapse. He let go of her hand and sat down beside a tree. "Why?" he asked weakly.

"Part of the tradition of birthdays is the giving of gifts. You were my birthday present from Daddy."

"Why?" he asked again. There were tears in his own eyes now.

She knelt beside him. The bitterness was gone from her face. "It's not my fault. Please believe that, it's not my fault. I didn't do it. But it gets so lonely here, and I wanted someone, needed someone. But I have to be careful. I'm the only heir Daddy has. You have to consider his problem. Any man I get will only be after my money, my position. I needed someone who could love me for myself alone, who wouldn't care about the money or the power."

He didn't look at her. He couldn't. His whole identity had shattered against the wall of reality. His mouth silently formed another "Why?"



"We had such a beautiful relationship," she prattled on, trying blindly to find something to say that would make things right again. "You weren't supposed to want to marry me. We could have continued on for years. It would have been so beautiful. I loved being with you, I loved making love with you."

He looked back at her. "I loved you," he said hoarsely.

"I know, you couldn't have done anything else. You were programmed that way."

He reached across and slapped her. It startled both of them. For a moment, there was only silence. Then she was gone, fleeing from him in tears, and he was left alone sitting beneath the tree in the artificial forest.

He sat for hours until dusk started gathering. His mind was a jumble of tattered thoughts. Who was *he?* Was he a man or a robot or a hopeless mixture of both? Did he have a destiny of his own, or was he merely a part of this asteroid's master plan? Could he think, or did his thoughts just mimic the patterns of others? Did he truly feel, or merely react? Did he have a soul, or merely a body?

He noticed that two of the gray squirrels were watching him in the twilight. Were they like him, knowing their situation and powerless to change it? "Hello, cousins," he said. "Or is it 'brothers'?"

They stared at him with dumb friendliness, blinking occasionally.

"It doesn't matter at this point, does it? We're caught in their web, that's what counts. We do as we're told and we love them for it. Most creatures have at least a life they can call their own; we don't even have that much."

He picked up one of the squirrels and, on impulse, bashed its head against the tree, killing the tiny creature instantly. *"Stupid!"* he shouted at the corpse in his hand. "I can kill you, and still you won't stop loving!"

He reached for the second squirrel. It bit his thumb and scampered out of range, then stopped and stared at him enigmatically. He swore for a second, then examined his thumb and finally looked back at the squirrel. "Thanks, brother," he said. "I needed that."

They found him there the next morning. He had taken a sharp-edged rock and cut open his wrists. Nola's father offered to have a new one made for her, but she refused politely.

The squirrels were found to be defective and had to be destroyed. New ones were made, but it didn't matter. Nola never went there any more. ○

NIGHT ON MISPEK MOOR

from page 33

second let go and disappeared from view.

Nightwalkers were coming up all around him. Vatch moved among them in calm haste, spraying life into them, and they stopped moving. In his mind he gloated. It should have worked, and it had.

For if anything in this experience was real, then it had to be caused by the biology of Sereda. So: something could infect the dead, to make them move. Bacterium? Fungus? Virus? Whatever it was, it had to have evolved by using dead lopers and other native life forms to spread itself.

It would walk the infected corpse until there was no sugar or oxygen left in the blood or muscle tissues of the host. That alone could carry the disease further than it could travel by itself. And if it found another host to infect along the way, well and good.

But the first step in infection would be to restart the heart. It *had* to be, or the bacterium couldn't spread throughout the host.

And if the heart was going . . .

The Spectrum Cure seemed to be healing them right up. He'd cured about eight of them. They lay at the base of the rock and did not move. Other nightwalkers clustered around them. For the moment they had given up on Vatch's rock.

Vatch watched some of them bend over the bodies of those he had injected. They might have been nibbling at the flesh above the hearts. A minute of that, and then they fell over and lay as dead as the ones they had been trying to rescue.

Good enough, thought Vatch. He flashed the light on his bottle to check the supply of Spectrum Cure.

It was just short of dead empty.

Vatch sighed. The horde of dead men had drawn away from the casualties—the *dead* ones—and gone back to trying to climb the rock. Some would make it. Vatch picked up his sword. An afterthought: he injected himself. Even if they got to him, they would not rouse him from death before morning.

The scrabbling of finger bones against rock became a cricket chorus.

Vatch stood looking down at them. Most of these had only been dead for hours. Their faces were intact, though slack. Vatch looked for Ray Tanner.

He circled the edge rapidly, striking occasionally at a reaching arm, but peering down anxiously. Where the blazes was Roy Tanner?

There, pulling himself over the lip of the crack.

In fact they were all swarming into the crack and climbing over each other. Their dead brains must be working to some extent. The smell of them was terrific. Vatch breathed through his mouth, closed his imagination tight shut, and waited.

The nightwalker remains of Roy Tanner pulled itself up on the rock. Vatch sprayed it in the face, turned the body over in haste, and found it: Roy Tanner's medical kit, still intact. He spilled out the contents and snatched up Roy's bottle of Spectrum Cure.

He sprayed it before him, and then into the crack, like an insecticide. He held his aim until they stopped moving . . . and then, finally, he could roll away from the choking smell. It was all right now. Roy had fallen early in the battle. His bottle had been nearly full.

For something like six hours they had watched each other: Tomás Vatch on the lip of the rock, seven nightwalkers below. They stood in a half circle, well out of range of Vatch's spray gun, and they stared unblinking into Vatch's flashlight.

Vatch was dreadfully tired. He had circled the rock several times, leaping the crack twice on each pass. "Cured" corpses surrounded the base and half filled the crack. He had seen none of them move. By now he was sure. There were only these seven left.

"I want to sleep," he told them. "Can't you understand? I won. You lost. Go away. I want to sleep." He had been telling them this for some time.

This time it seemed that they heard.

One by one they turned and stumbled off in different directions. Vatch watched, amazed, afraid to believe. Each nightwalker seemed to find a patch of level ground it liked. There it fell and did not move.

Vatch waited. The east was growing bright. It wasn't over yet, but it would be soon. With burning eyes he watched for the obvious dead to move again.

Red dawn touched the tips of glacier-spilled rocks. The orange dwarf sun made a cool light; he could almost look straight into it. He watched the shadows walk down the sides of the rocks to the ground.

When the light touched the seven bodies, they had become bright green patches, vaguely man-shaped.

Vatch watched until each patch had sprouted a bud of yellow in its center. Then he dropped to the ground and started walking north. ○

TIME OF NEED

from page 86

I blocked it entirely she stopped, and for the first time her thought included the concept of my awareness But her intent was strong; again she walked in the direction of her own choosing.

I blocked the other side also; she could see nothing. After a pause I restored that side, then allowed a moment of sight on the other, to tell her that to see fully she need only turn. Sensory blockage is a limited means of communication, but the *hlurin* respond to it when it is more convenient to guide them without exerting full control. With her greater awareness, I felt that she should grasp the concept easily.

She understood—I was certain she did—but she would not turn. Like a *hluri* at the peak of breeding cycle, she was totally subject to her own urge. I did not need her thoughts to know her feelings; her blood tasted of fright and anger.

She did not realize my own need; there was no way I could tell her. We contested for a time. . .

I blocked her vision completely. By touch, she found a stick with which to probe ahead for obstacles, and proceeded slowly. I blocked hearing; she slowed further but still continued. I blocked the sensation of surface-touching; she lost the stick and dropped to proceed even more slowly on all four limbs. Her blood told of feelings I had not known, and I felt the pain of them as she did.

So after a time, since I was failing of my purpose and our pain was to no point, I restored her senses and abandoned all effort to guide. In part, my feeling of defeat was mixed with relief; it had not been pleasant, risking injury to her as she fumbled without warning senses.

There was a chance, I thought, that her destination might be near enough that we could reach it without disaster. Or that we would meet another traveler willing to accompany us or lend me a *hluri* or two. At necessity one of us can maintain three *hlurin*, or if activity is moderate, one of them nourish three of us.

And if the distance were too far, and we met no one? I had tried to turn her. . .

We traveled many days but saw no one. I do not know the distance; she moves faster than the *hlurin*. Slowly and incompletely we learned of each other, though by the nature of our contact I learned the more.

In small ways she came to accept my guidance. Often when we crossed areas where food was scarce, I noticed hidden

plants that she did not. At first I dimmed or blocked vision in momentary intervals until she paused and looked around. Later I found I could intensify her sight in the desired direction; the new method was quicker and easier for both. Our relationship became more complex—more rewarding—than is possible with a *hluri*, even though we could communicate less fully.

I found that her kind breed as do the *hlurin*—but at will, not by cycle. They do many things—and much more—that the *hlurin* do, or can do, only under our control. They are, in my view, almost a combination of ourselves and *hlurin*, together in the same form.

And I learned that inside her, also, a fulfilled egg was growing to term.

She could learn of me only indirectly, by the things I could show her: how to look for food where it is scarce, how to avoid the rare places of treacherous footing—the things we must know, to live. She came to realize that something like the *hlurin* must exist—or else I could not—but nothing of what they are like, nor the degree of our mutual need.

I am not certain whether she became aware that I have my own senses, independent of hers though inferior to them.

I do not know—nor did she—how near we might be to her destination, to others of her kind. But we shall go no further; my time is here and she would not turn. I wish it were not so.

If we had reached her goal, there would be other creatures that could serve. Had I not chosen to breed at the last togethering, this time would not be upon me, nor upon the one whose eggs I fulfilled in return. But once begun, we have no control over this aspect of our lives.

Against my wishing, my body has produced the essences that spread quickly through her blood; she can no longer move. I have blocked all her senses—her awareness, shut off not only from all that is outside but also from what her own body would tell her, is in much turmoil but will be free of pain. It will not know when it ends, I think—the *hlurin* do not, in the rare times we must use them in this way.

My eggs have opened; the egglings move into her. As they must, they will feed and grow—and in that feeding, she will die.

Without her, I will die also, and my egglings with me. I wish I could have made her turn. . .

But most of all, I wish she could know that her death comes only from my body—not from my will. O

THE MOON AND MARCEK

from page 27

and he has to get back to Earth before his rent runs out.

MCQUEEN: Oh.

MARCEK [*through clenched teeth*]*:* All right. All right. I'll go along with the gag but *absolutely* no—

MCQUEEN [*fluttering hands*]*:* Wait. Please. No, no . . . if I understand you—Marthek, I *couldn't.* You're too straight and . . . and hairy.

MARCEK [*relieved in spite of prospect of breathing vacuum*]*:* Okay, Captain. No hard feelings.

Captain opens his mouth to say something but is interrupted by shout from bar. JACK *has jumped off stool and is staring at him, arms outstretched.*

JACK: Queenie!

MCQUEEN: Mar*celle!*

WISE MARTHA *and* MARCEK *exchange surprised glances. Suddenly* WISE MARTHA *is struck with an inspiration; locates a tablet of forms in her voluminous purse. She runs over to* JACK *and* MCQUEEN, *now locked in affectionate embrace. Behind her back she has the tablet and a small red inhaler.*

WISE MARTHA: You two know each other?

MCQUEEN: Do we ever.

JACK: The only reason I joined up was to be near Queenie.

WISE MARTHA: Hey, that's really neat. I'm a switch-hitter too.

JACK: Beautiful. I didn't know that.

WISE MARTHA: Here, let's celebrate [*offers inhaler*].

JACK: Only if Queenie can have some, too.

WISE MARTHA: Sure, go ahead.

JACK [*sniffs*]*:* Wow. That's the real stuff. [*sniffs again*] Must have cost a fortune.

WISE MARTHA: I *sit* on a fortune, honey. Go ahead, Queenie. [MCQUEEN *sniffs*] Have another, Jack.

JACK: You can call me Marcelle. Thanks.

MCQUEEN *and* MARCELLE *take several more sniffs apiece; get blasted.* MARCELLE *is in another world, head lolling from side to side.*

WISE MARTHA: Could I ask you a favor, Marcelle?

MARCELLE: Any little old thing, Wise Martha.

WISE MARTHA: Let me have your autograph. Right on the bottom line of this form here.

MARCELLE [*giggles*]*:* I can't even read the blasted thing. What does it say?

WISE MARTHA: It's just a club. Lots of people like us in it. Might even make you some money, too.

MARCELLE: Can't lose. [*signs*]

WISE MARTHA [*inspects signature*]*:* Good. Now . . . please let go of the Captain.

MARCELLE: Huh? [*drops arms to sides*]

WISE MARTHA: You are now an Auxiliary Member of the Space-Faring Whores Association.

MARCELLE [*to* MCQUEEN]*:* What does this mean?

MCQUEEN: I dunno.

WISE MARTHA: It means that you're a pro now and *I am your agent!* And you don't do it for free without my permission—we don't like scabs!

MARCELLE: Gee . . . uh . . . not even with Queenie?

WISE MARTHA: Nope.

MARCELLE: How much should I charge him?

WISE MARTHA: Marcek, how much should he charge?

MARCEK *has been staring open-mouthed through the whole exchange. He does some figuring with his finger on the tablecloth.*

MARCEK: Three hundred fifty-three M's.

WISE MARTHA: And as your initiation fee, all of this money goes into the Maxwell Marcek Relief Fund.

MCQUEEN *pulls out a roll of bills and counts out a few dozen, hands them to* MARCELLE. MARCELLE *recounts and hands them to* WISE MARTHA *with a wry smile.*

MARCELLE: You know something?

WISE MARTHA: What?

MARCELLE: They don't call you Wise Martha for nothing.

Stage lights fade and stage fills with holographic projection of space shuttle gliding toward Earth. MARCEK *is going home.*

CAST OF CHARACTERS

Marcek ..... *a down-and-out spacer*
Wise Martha ..... *a free-fall floozie*
Bartender ..... *a bartender*
Manny, Moe and Jack ..... *three spacers on krrf*
Merry Mary ..... *a younger floozie*
Captain McQueen ..... *Captain McQueen*

O

from page 7

I was on my feet. "I'll take it," I said.

"You sure? It might be dangerous." She knew my views about saving my skin.

"It might be," I came back, with what seemed to me to be impeccable logic, "but I wouldn't trust the job to anyone else."

The U.N. negotiator's ship was hit on approach and crashed, killing all aboard. I consoled myself by imagining that nothing would have come of the peace talks, anyway. When that didn't work, I went to the Officer's Club and got so drunk I fell off my barstool.

I was terrible with Stafford the next day. I wasn't the only one taking it hard, because Colonel Chambers was terrible with *me*. She sent me clear across the battlefield to deliver a confidential despatch to General Moody, who didn't want it. The General was down with a touch of the Cerean Flu, whatever that was. I think you get it from bottles.

I was furious with Chambers. I could have been killed on that wild goose chase across the front lines if I hadn't had the foresight to send Stafford instead. And that meant that Stafford could have been killed and I was beginning to like Stafford in spite of myself. Fortunately, she kept off her toes and came back under her own power.

That day was the closest we ever came to "going over the top," just like World War I, which the Cerean War resembled more than any other conflict. I for one would have cheered them on, all those angry lads and lasses storming out of the trenches in uncontrolled fury, ready to blow the guts out of the miserable rats who had shot down the hope of peace. We knew it must have been them by simple elimination; not a person on our side but wanted deep in their guts to get the war over and head home. It *had* to have been them.

On closer examination, we found that my opinion was the prevailing one. That is, everyone would have cheered the others on, but no one cared to go out there themselves. It sounded like a good way to get killed.

Do you know that in World War I, they had charges like that as a matter of course? I saw it in a movie. Someone would yell, "Whatsa matter, youse guys wanna live forever?" and they'd swarm out of those trenches, dying by the thousands. What the officers did to those poor doughboys to get them into such a pitch I don't even want to know. Patriotism must have been a powerful thing. If I ever gave such an order I'd live just as long as it took them to realize I was really serious.

But I'd never even think of giving an order like that. What I told the soldiers under me was to keep firing over their heads, just bringing their sights down into the ground once in a while to see if they were still firing or had run out of ammunition.

I was relaxing with Stafford and old Prospectin' Pete in the Officer's Club a few months after the downing of Ambassador Ortega's ship. Relaxing was perhaps not the proper word, since I was so tense I kept spilling my drinks. The trouble was that no place was safe anymore. There were rabble-rousers at work among the troops, vile people who were spreading the idea that we—officers—were not entitled to sit at ease below-ground while they—enlisted—were taking their chances in Alpha Trench. I had to admit they had a point, since up to a few weeks before the death rate among officers had been significantly below that of enlisted.

But not anymore. Someone had revived the ancient and hallowed art of fragging, and the death rate had just about equalized. It had gotten to where an officer who valued his life had better spend a great deal of his life out there with the troops, shooting like everyone else. Those that didn't could find a live grenade in their bunk. Many had, and I had gotten the hint.

The trouble with that was in trying to figure the odds. After all, it wouldn't do me any good to go topside in an effort to save my skin from a disgruntled private if I took a round between the eyes. It was an interesting problem, and trying to chart the safest course took up a lot of my time; hence my nervous interlude in the almost deserted Officer's Club.

Stafford didn't much care at the moment. She was aware that the club was a dangerous place to be, but couldn't worry about it. The reality of the war had descended on her a few weeks ago and she had been in a bottomless depression since then. I was beginning to wonder if she'd survive it.

Prospectin' Pete didn't care, either. I don't know what his real name was, but he was a rarity on Ceres: a non-combatant. He was one of the reasons I felt reasonably safe at the moment; I was hoping a potential bomber wouldn't toss his egg with Pete in the room. I had been asking him about this at regular intervals and he had reassured me in that quiet way of his that it was true, he was immune to death.

He had come in one of the earlier waves of senior citizens to arrive at the asteroid belt, ready to make their fortunes, back in the good old days when the "war" was just a matter of border patrols to protect property rights. But he had been here when the shooting started, and the Agent had not allowed him to leave. That was before we killed that Agent in the Great Big Uprising that was supposed to stop the war but didn't.

Pete was about a hundred years old and freshly embarked on a new career. He had been a lawyer on Earth and was now a prospector. He thought of the war as just an interlude he had to wait out before he resumed his scouring of the more insignificant chunks of rock between Mars and Jupiter.

"That's a good question," he was saying, and I slowly realized he was talking to me. But I couldn't remember what I had asked.

"A more realistic figure might be around a million dollars, but you have to remember that if all your suits are successful Outward Bound will be bankrupt. It may not be able to repay its debts much better than two or three cents out of a hundred dollars."

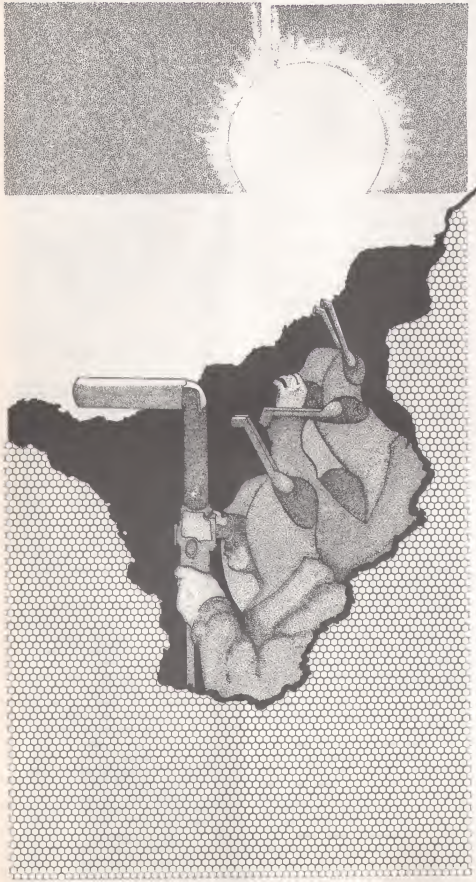
So we had been talking about my damage suit, a subject Pete was forever being approached with and was always willing to talk about. But I found that I was no longer interested. The back of my neck itched. I was about to summon the resolution to go topside when Colonel Chambers threaded her way clumsily through the tables and took a chair.

"The second negotiator is on her way," she said, taking a dirty flask from a pouch at her side and wiping it with her hand. She took a long pull at it. "They didn't want to send her; seems she's too valuable to lose like they did the last one. But she says she's been aware of this situation for a long time and she's convinced she can end it pretty easy."

She chuckled. "The U.N. is boiling mad. They were keeping all this business secret as a condition to satisfy both the Companies, but that's all over now. They've made it all public and the masses are up in arms. The old Board is out, and most of them are under indictment. I'll bet they're wishing there was still some place like Argentina to go to." She chuckled again, and I joined her, it being one of my most cherished fantasies to picture the entire Board being riddled with explosive bullets.

"So there doesn't seem to be anything in the way of peace, right?" Stafford said, not quite daring to look hopeful. "I mean, what reason could the Con people

A soundless death in vacuum awaited any rookie foolish enough to stick his head up.



have for shooting this ship?"

Chambers raised her eyebrows. "What reason could they have had for shooting down the other ship? I'm still assuming that they're humans like us, though it's hard to believe after the last time. But for whatever it's worth, a cease-fire is supposed to take effect in about six hours. And if things go like they always have out here, Con will break the cease-fire in about six hours and one minute."

I was already on my feet and headed for Alpha Trench.

"Six hours?" said Corporal Camadi. He switched to the all-hands circuit. "Major says there's to be a cease-fire in six hours."

There was no cheering, but as one person the line of soldiers unfastened themselves, lay their rifles beside their boxes, and filed into the passage leading belowground. Not another shot was fired from the O.B. positions.

We were far behind the lines, back at the landing pad for the supply ships. Ambassador Petersen was due to arrive in thirty minutes. There was me, Stafford, Chambers, and an assortment of generals, including the roly-poly suit of General Atkins, Chambers' immediate superior. There were also the scary forms of the representatives of Consolidated with the blue paint on their helmets. I had not seen any of them for six years, and in that time they had acquired the status of ghouls, the people who had killed Natasha. I could not look at them. Instead, I looked at the hulking launcher for the interceptor rockets we used to shoot down the Con ships.

The interceptors were the one thing in which Con seemed to be technologically ahead of us. They were tempermental things; an uneasy compromise between the brains needed to hit a moving target at a range of up to a million kilometers and the hideous cost of producing them. Ours were not too good. We scored a hit every so often, but usually only when the trajectory required was nearly a straight line. If they had to shoot around the curve of Ceres their inept guidance circuits had to come into play, and they became increasingly vulnerable to radio jamming from Con. The Con launchers were at the antipodes from ours, with the front lines half-way between the two sites. So when their ships were at their most vulnerable range, our rockets had to do a lot of steering to hit them. We didn't get all that many hits.

For some reason, Con did a lot better.

Not many survived for long on Ceres, and those who did knew that someday it would be their turn. On Earth!

An appalling number of our ships were hit when above our pad, and so "protected" by the planetoid. Many of the hits were not fatal, and we had been able to deduce from this that the enemy rockets were equipped with a proximity device that released a large number of small charges rather than one large warhead; a sort of scattershot MIRV.

General Atkins was talking to Chambers, and I listened in.

"We've found out how the home office was able to produce all our armament and not let the fact of the war get out," he was saying. Atkins was a mercenary, a hired military man sent out here to win the war. O.B. had not gotten their money's worth, which was not unusual. He was incompetent—no more or less than the rest of us, but somehow it was different with him. After all, we weren't professional soldiers, and he was supposed to be. He was one of the few "patriotic" people out here, and I think some of his failure stemmed from the shock he got when he discovered that his troops would not storm the enemy. After that he brooded a lot, and from time to time came up with plans that called for idiotic amounts of risk which were promptly squelched. I would have killed him many times over, but I was afraid he would be replaced by someone less tractable.

" 'Individual Excavating Tool,' " he said, patting the rifle slung over his shoulder. He was the only officer who was never without one. "The dodge is that with everyone in suits, the work of mining is pretty dangerous, so they designed this tool to let us all stand a safe distance away and strip-mine from the surface. We can dig out a trench from half a kilometer, and when the chips have settled down, we go out, safe and sound, and gather them up. The ParEyes are to improve our aim."

It was all hideously true. We *did* dig trenches on Ceres, but we didn't mine uranium in them; we died in them. The ParEyes *did* improve our aim, but not at the ground. The mining operations were all in shafts far underground, operated mostly by machines. Atkins said there was another cover story that we had had tremendous problems with the mining machines, involving dust in the moving parts and vacuum welding. We *had* had problems, but they were all solved long ago.

"But don't they realize that the gravity here would make that a very wasteful business?" It was Stafford speaking. "The charge in the bullets would send about . . . oh, around ninety percent of the rock into long parabolas, and it would land a long way off. Some of it would even go into orbit."

Atkins looked at her patronizingly. "*You* know that because you're an engineer, but most people aren't engineers. It sounds reasonable enough to them. But you're right. Before the whole sham was exposed there was a movement from some conservationists to use a less wasteful method. The Company was worried about how they were going to counteract it. All academic now, of course."

"And the radar installations, and the rocket launchers . . ." Chambers had already guessed the answer, but asked anyway.

" 'Meteor defenses,' " Atkins chortled. "To shoot down any rocks that were heading for the factory." I think we *had* shot down one such rock, though there was much debate later if it really would have hit anything.

The second negotiator was Doctor Margery Petersen. She was only half Swedish, but the other half was Swiss, so her credentials of neutrality were flawless. Her Doctorate was in political science, and she had extensive experience in the settlement of armed conflicts dating back to the days when they were much more common than they are now. She was about eighty years old, but looked like a teenager. I don't much care for that, but to each his or her own.

She thought she could end our war with very little trouble. I was anxious to believe her, but still had my doubts. I was wondering if Ceres would fool her, as it had so many others. The war should never even have started, much less gone on for seven years.

But she talked a good line.

"What you should understand at the outset," she said to us as we waited in the conference room for the arrival of the rest of the delegations, "is that I have spoken to the heads of each of your corporations, and the desire to end the hostilities is there, and it is real. The ones who started it are out, and the new officers are anxious to settle it and get back to business."

We were waiting for the group to arrive from the Con landing pad. There had been a dual ceremony with another U.N. ship landing on their side. Our people had been behind their lines, and they had been behind ours, as emissaries of good will and—not incidentally—as hostages if something went wrong. The arrival at the other pad was symbolic, and the ship Doctor Petersen travelled on had been determined by lot. I think they call this diplomacy.

"Why have they suddenly changed their attitude?" someone wanted to know. With something of a shock I realized it was a Con general. "Even at the height of the war, both sides were posting profits Earthside. Declaring dividends and all. Why stop it?"

"Public pressure, for one thing. But even before the public was made aware of what's happening out here the desire to end the war was there. You have to realize how a corporation works. It has a million stomachs and no brain, and consequently very little moral sense. Both your corporations have to answer to stockholders, but none of them really knew the extent of the war out here. The largest reason why it's still going on is plain old inertia. Corporations are conservative institutions, and don't change a policy that seems to be working all right, bar a few unpleasant side-effects. Not without a very good reason. The reason that finally moved them is the logical one for a corporation; increased profits."

She was not big on formality. When the other representatives arrived she went on from where she had left off, explaining her view of how the war had started, why it had continued, and why it was finally about to come to an end. It all sounded logical enough, if a little cold. But historical forces don't take human suffering into account.

Doctor Petersen laid the blame for the war to the Chen Drive, which would have deeply shocked Chen Sue Ling if she had not already been dead for three years. Madame Chen had been a pacifist, and not the first one whose great invention had been the cause or means of a war.

The Chen Drive had revolutionized space travel nine years ago. It is a fusion motor that can be made as small as a suitcase to power a home or vehicle, or as big as a room to power a plane or spaceship. It is cheap, safe, clean, easy to mass produce, and about ninety-nine percent efficient. Chen Sue Ling owned it outright, and died a multi-billionaire. While it had great impact on all fields of human endeavor, its greatest effect had been on space travel. Where before a ship had been ninety-five percent fuel tank and five percent payload, those proportions had been nearly reversed. For the first time significant numbers of people were able to leave the Earth.

One company designed and produced a ship that was the outer space equivalent of the personal ground-car. It cost

The dream of revenge was all that kept many of them alive, even if they had to die to attain their revenge.

around a hundred thousand dollars stripped down. And stripped down meant that some of the triplicated systems were actually only duplicated, and in some cases there would be no back-up at all. People started jetting out into the vacuum who could hardly program a computer, and thought that if they stepped out of their ship they would be ripped away by the terrific air currents. The mortality rate was very high.

Though the price of these "model-T's" was reasonable, it was still quite a chunk of cash for most people. So it was that the Great Land Rush of '45 was composed for the most part of senior citizens. They had worked all their lives and had ready money, and were lured by the advantages of weightlessness, by the chance to have an adventure after the pleasures of retirement had begun to pall, and by the small but computable chance of striking it rich in the asteroid belt. With human life expectancy a largely unknown quantity as a result of medical science, many found it too much to bear to face a century of taking it easy in a retirement village.

When the Golden Age Wave reached Ceres, it found the two Companies unprepared for its arrival and rather bemused by its very existence. But the bemusement didn't last for long. The prospectors began landing and staking out claims on land that neither Company had thought it would be necessary to claim. They had thought of Ceres as their plum, and before the Chen Drive they had been right.

There had been no competition in the old days; there was no need of it. Mining the asteroids was such a frighteningly expensive business that even with the astronomical price of uranium O.B. and Con had barely been scraping by on a billion-dollar shoestring. There was no question of expansion: the cargo ships were too expensive. There was enough uranium on Ceres alone to supply both O.B. and Con for thousands of years at the current rate of extraction. In those days we lived in harmony, and had friends working for Consolidated.

Then the first prospectors had arrived, and at the same time, the first Chen Drive cargo vessels. We were stunned at the changes that were planned. The first ship took out a full month's production of uranium, and others were on the way. They traveled not by the old Hohmann orbits, but by fast hyperbolas that would cut the round-trip from years to a few weeks. Vast new shafts were planned, and the capacity of the diffusion plant was to be increased tenfold just for starters.

The Companies were making money like a mint, and began to cast a doubtful eye over the claims being filed on Ceres.

There was virtually no space law in those days, and absolutely none beyond Luna's orbit. There had been no need for it. So there was no claims office for the free-lancers to turn to. They were adopting the age-old expedient of driving stakes into the ground and sitting back to defend their claim against all comers.

It was then that the Companies decided to stake claims of their own. And they went about it in a big way. Each of them claimed all of Ceres, in an excess of acquisitiveness not seen since the Pope divided the whole world between Spain and Portugal.

And O.B. instituted patrols along the border that had sprung up between our land and "occupied" territory. Then one of their patrols shot at one of our patrols. Later a man was killed. Before long we were digging trenches. Escalation.

"No one has given any real *thought* to the situation since the day both of you decided to claim this whole ball of garbage. It has been allowed to snowball, because of unimaginative thinking, or rather lack of any real insight at all.

"Here is where we stand today. Both O.B. and Con have still been making handsome profits out of this rock, better than they had ever dared to suspect when they got into the business more as a public service gesture to ease the energy shortage than to make money. There is so much money in this business that the independents, denied access to your refineries, are still able to bring *raw ore* back to Earth and make a profit. It had dawned on some over the years that without the tremendous diversion of manpower to fight this war, both Companies could be making a hundred times what they are now. But it had become a matter of principle and pride, as these things tend to.

"But last year, O.B. failed to post a profit. Con was just scraping by, and its stock had begun to slip. At last the two parties got together and decided to end it. They had thought it would be as simple as turning off a switch, but hadn't reckoned with the hatreds that have sprung up out here, where you've been killing each other for years. That's how we lost the first negotiator, and if I'd known what was going on I'd never have let it happen the way it did. There should have been safeguards. That man you people shot down—and he was a close friend of mine—" she glared at each side in turn, "was walking into the heat of battle, thinking a white flag would be sufficient. And one of you shot him down." She glared again and despite her veneer of youth, something old and hardened and implacable looked out of her eyes. "I'm almost glad both of you blame the other side, because if I really *knew* who shot him down, I might be too prejudiced to proceed."

I was shocked speechless; and a good thing, or I might have blurted out that *I* knew who did it and blown a day's careful work. Tempers would have needed soothing, because it's certain that if Con could tell a whopper like accusing *us* of shooting him down, they would brazen it out and feign indignation. As it was, I bit my tongue and just let my hatred seethe inside me.

After that, Petersen took out a long scroll and identified it as the protocols of the peace agreement worked out by the Boards back on Earth. She read it to us in a rapid drone, pausing here and there to emphasize salient points with a truculent stare, and laid it on the table. She said there were orders from each Board on Earth that the generals of each side were to sign it with absolutely no back-talk, and she further assured us that the first sonuvabitch that balked would be personally horsewhipped by her own hand. I didn't doubt it for a minute.

So there was actually to be peace. I still couldn't believe it, but there was a part of me that was itching to get back to my bunk to put the finishing touches on my lawsuit.

The armistice was to be stylized and symbolic. Doctor Petersen loved the pageantry of winding down a war; I think she liked to see this tangible result of her labors.

On the last day of the war—there had been no actual shooting for three days—we were all to leave the trenches and walk slowly with our weapons reversed out to face the approaching line of Con soldiers. Officers were to see that all ammunition was collected and stowed away out of reach, and that all weapons were in a non-firing condition. I had done that; there was not a round among any of my people, and all the other officers on our side had been as thorough as I. At the exact centerline between the trenches we were all to stack our weapons and shake the hand of a soldier from the other side. I thought this was going too far. It would be awfully difficult to shake the hand of a sperson who just might be the killer of Natasha, but I could do anything if it was all really

Neither side could accept the guilt for continuing the war that the peacemaker wanted to lay on them.

going to be over.

So on the signal, I gave the command to go over the top, and jumped. It was only with a severe effort that I forced myself to make that easy three-meter hop; I was too conditioned to think that over the edge of that trench was sure death. But I made it, and after that it seemed that everything would be easy. When that frightened part of me saw that I was in the open and nothing bad was happening, it relaxed and let it ride. I was even enjoying the heady danger of it all.

We approached the line of soldiers who were in their turn approaching us, and without warning the corporal walking next to Stafford stumbled, and I heard that receding wail like a soul flying off to hell. The corporal was dead, the front of his suit blown away by an explosive bullet.

I found myself running in that shambling way that is the only practical gait in the low gravity, then the trench was opening beneath me and I floated like a feather back into the protective walls of gray rock. All around me was frantic activity as everyone fussed and fumed with their rifles, and looked around for rounds to fire. I was frogmarched off to the magazine, still in shock, and forced to unlock it. The firing began even before I could find my way back to the trench.

Stafford was fiddling with her slide rule. I hated her, just as strongly as I had loved her a few minutes before when we had made love at the brink of the end of all reason. It had saved my sanity after a day of risking my life in a charge over the top into the teeth of the most withering fire I had ever seen. Hundreds were dead, and what I wanted to know was: why me? Why had I survived in that hell where nothing could possibly survive? Who or what was toying with me, making me believe I was immune to rifle fire that should have killed me a dozen times? I suspected darkly that I was being set up for a big shock when my bullet finally found me.

Petersen had been raging at us in the conference room in no-man's land. What kind of animals are you? she would ask, and I had walked out. I knew what kind of animals were on the other side: lying animals. Con claimed one of their soldiers had been hit, too. Ridiculous.

So it was the third day after the peace. We were fighting like we had never fought before. The army had been collectivized, and generals fought and died beside privates. They had no choice. It was take your chances going over the top or be blown apart by the Provisional Committee.

That the peace talks were still going on at all was a tribute to the sheer cussedness of Doctor Petersen. But they could break down at any time. I wished they would. To sit for hours in the conference room and then go out and put in my shift on the line was getting to be more than I could stand. Pretty soon I would be unable to distinguish between the two activities, and would leap across the table to throttle people with my bare hands.

And in the middle of this, Stafford was playing with her slide rule. Where did she think she was? Back in class at Cal Tech? I thought about killing her, and made up my mind to do it. I bore her no malice personally, but that slide rule had to go and I was in no shape to reason with her. I was considering how to do it with the least exertion on my part when she spoke.

"I've figured something out," she said, oblivious to her peril. But she had distracted me. I wanted to find out what could possibly be important enough to break into my thoughts. *Then* I would kill her.

"I'm almost afraid to tell you about it. Considering the state you've been in." She gave an apologetic smile that said, *Sorry, but we both know you're crazy,* and it saved her life. It brought me back to something like myself.

"Try me," I said.

"I know why the truce hasn't worked, and it has nothing to do with treachery, at least not on the part of those poor pawns we've been shooting at." She had put herself back in danger.

"Tell me," I said. There was an edge in my voice, but she didn't notice it.

"It's simply that the corporal was killed by a returning bullet. One that may have been fired years ago and has been orbiting Ceres all this time. It's a staggering thought; there must be some kind of moral in it. But I'm too tired to think of it."

I hit her in the face, lifting her off the bed and throwing her with a satisfying crash into the wall. She was stunned for a moment and lay there naked, bloody, and bouncing slowly on the floor. Her nose pointed off to the right.

"*Stupid!*" I yelled. "Idiot! Do you realize the *chances* against anything like that? Ceres is a *big place.* That a bullet would return at just that moment, at the worst possible time for everything . . . why, it's impossible to believe that you'd even *think*—"

But here I had to stop, because she had launched herself off the floor and all I saw was blood-smeared teeth coming at me in the most chilling grin I have ever seen.

She could have killed me, but satisfied herself with just beating me until I could hardly move. It had been an all-out attack, totally devastating, and was the best thing in the world for me at that time and place. I was almost rational when she sat back on her knees and decided to let me live. Her voice was nasal and petulant when she talked again.

"That's why this was has gone on so long," she said. We both started to cry, and she stopped talking and embraced me. I loved her again, but she still didn't trust me. She backed away. I can't blame her.

"All you think about is fighting, when a little thinking might solve all your problems. Not just you, everyone. THINK!" She screamed it. I tried to, but was in no shape for it.

"You do it for me. I'll listen."

"That's something." She recovered her slide rule.

"All right. I'll do the thinking for you, and for everyone else. You say Ceres is a big place, and you're right, but have you sat down and figured out just how big? How many square kilometers of surface area it has?"

I ventured a guess. "About a million?"

"Almost two million square kilometers. All right, listen closely. This may be a little fast for you. I make it a seven-year average of 75,000 people fighting here at all times. That means only a few at the start, up to our current strength of 60,000, matched by another 60,000 fighting for Con. Of that, I think about 10,000 are in the trenches in rotating shifts, twenty-four hours a day. How does that sound to you?"

"Close enough."

"Those 10,000 are firing their weapons constantly, or almost constantly. I've used a figure, which I think is conservative, of half of the time when their rifles are actually firing. At the rate these guns fire, which is three hundred rounds per minute, that makes a hundred and fifty rounds per soldier, per minute. Still with me?"

"Go on."

"Over a period of seven years, with 10,000 soldiers firing, that comes to—get ready for it—five and a half *trillion* rounds. Now *you* tell *me* how many of those rounds ever hit anything."

Over 30,000 died on Ceres, but many more would die before those 30,000 lives were avenged.

I wasn't feeling at all good. My head was swimming, from the beating and from the numbers I didn't want to hear.

"No more than half."

"That was my estimate, too. About half of them hit the ground, and the rest go off into the sky. But you can't forget about those bullets here like you can on Earth. The muzzle velocity of our rifles is below escape velocity for Ceres, but is fast enough that there's not chance they'll fall back to the ground after a few kilometers. They all go into orbit. That's two and a quarter trillion explosive satellites. Some of them impact on their next pass because of irregularities of the surface. But all of them that return must return, and they skim close to the surface, sometimes hitting something, sometimes going back up for another pass. That's about half a million rounds for each square kilometer of surface area. I'm just estimating, of course, and this is the area where you might disagree with me. I can't figure yet just how many bullets you can expect at a given second on a particular piece of ground, but the rough estimate I've gotten is that you have about a one in three thousand chance of getting hit if you go above the trenches and stay there for a while. It isn't a safe place to be, even in a cease-fire."

"That still seems high," I said, a little desperately.

"Right, I forgot the other factor. Remember the rounds that hit the ground? Another two and a half trillion? They explode on contact and send up a shower of from a dozen to several hundred--take your pick--high-velocity particles of rock. Most of these go into orbit, too. And they're quite fast enough to be dangerous. There could be quadrillions of them by now."

She looked at me and started laughing. It was the only time she had ever been cruel to me; I had asked for the beating, but this was uncalled for. I considered killing her again, but that wouldn't solve any of my problems and I was no longer sure I could do it. The more I thought about it, the more it seemed that suicide was the solution.

"So there we have the Cerean War, the war that can't end. Oh, we'll stop the shooting all right. You and I have to get to Doctor Petersen very quick and get this around. I think it'll be over in a few days. But the war will go on for a thousand years. We may have to abandon Ceres entirely. I don't see how ships will find it safe to approach too closely, in case you hadn't seen it yet, that's the secret of the Consolidated "Proximity Missile." It doesn't exist. They probably buy their missiles from the same firm we do. Our ships have been hit by orbiting bullets, and theirs have, too. They've been telling the truth, all the time you were talking to me about what damnable liars they are." She laughed again, with an even harder edge than before. "You! You and all the rest of them. If you'd only been willing to concede that they're just like you are, just scared men and women sitting in a miserable trench, getting shot at. But you made them into monsters so you believed they violated the truce and shot down the ambassador . . . ah, I'm sick of talking."

But she got one last word in. "Maybe they can make this place into a monument to the stupidity of war. And I've thought of a moral from this. Want to hear it?"

"No." She looked at me, and didn't like what she saw. She had roundly trounced me a few minutes before, but now she looked worried. She backed away from me and out of the room.

But she needn't have worried. My hatred wasn't for her.

It was like Stafford said; the shooting is over now. It was hectic for a while there. The soldiers killed everyone over the rank of Colonel, and quite a few Majors. I survived the lynch mob by undergoing a psychotic interlude during which I so impressed the mob with my hatred of Outward Bound and my worth to them alive that they carried me away from the firing squad on their shoulders. I had surprised myself, spouting an inspired glossolalia of murder and bloodlust that was straight from the slimiest regions of my battered mind. Stafford says I never recovered, and she may be right, but it doesn't matter now. We're going home.

Not in the way anyone expects, though. I am sitting in my compartment in the return ship, and in my lap is a heavy lead box that's probably doing irrevocable damage to my reproductive organs. It doesn't matter; I'll never have a chance to use them again, not for reproduction. The box is a fission bomb. I made it with my own hands. It's very crude, fairly inefficient, and extremely dirty. It's also powerful enough for the job I have in mind.

I'm going to blow up the Tamanrasset Copper Mine in Algeria. I have a platoon of fanatical soldiers whose job it will be to insure that I am able to get there and stay there long enough to blow the entire mountain off the face of the Earth. It is outside the realm of possibility that I will survive this experience.

Why Tamanrasset? Because it's owned by Outward Bound. O.B.'s troops are finally coming home, and when we're through there will be nothing but radioactive craters to indicate the Outward Bound Mining Company ever existed. We are going to obliterate O.B. We are going to exorcise it.

We are going to cauterize it.

We are invincible; nothing can stand in our way.

I had thought in the past that I might blow up a Con office when I returned, but that's impossible now. The Con people are going to handle that. It was a grave mistake on the part of both Companies to screw so many engineers and scientists, right in the middle of the most inexhaustible source of uranium in the Solar System. They won't make the same mistake again.

Why am I doing it? Stafford says it's because I've cracked; after seven years of devoting myself to survival, it seems more than passing strange that I'd go out on a suicide mission. It even seems strange to me. But I'll do it.

Part of it is Natasha. I see her all the time now, waking and sleeping. She's come out of the world of nightmare and walks beside me all the time. (I can see her this very minute, and not the alive Natasha I want to remember, but the thing I saw when I got her faceplate open and looked at what had happened after the bullet had passed through the faceplate and her forehead to explode *inside* her head. Blood is boiling from her empty eyes; already it has frozen black from her open mouth.)

Another part is the "moral" Stafford talked about. She says I missed it entirely, and am now just perpetuating the awfulness that caused this nightmare in the first place, this war that won't ever stop for a thousand years. But the way I see it, we're going to create a monument back on Earth, one that will last a long time.

Here's the way I see it:

Outward Bound dead:	15,585
Outward Bound wounded:	12
Consolidated dead:	15,833
Consolidated wounded:	9

The complete figures won't be in for a hundred years, when the last death could occur out here as a result of bullets we fired. But we'll be remembered even longer than that. A thousand years from now the geiger counters on Earth will still be ticking off the score. ○

VERTEX POTPOURRI

from page 14

mortgage.

Accident? Hey—where you *been?* Mars, huh? Well, yeah, I guess you wouldn't have the latest. Not much doing up there.

No accident, though—strictly business. Used to be a joke, you know? Go to borrow money, they want your right arm for security? No joke, these days.

It's the credit cards, Leon. Everybody has a satchel full. And too many running out on the bill. So they set it up this way.

No, not all that bad. Just so they know you come back and pay up, if you can. I mean, this arm ain't the greatest, and that's on purpose. So you keep paying, pay it all off and get your own meat back.

Sure you do. You get it back, if you ever get all paid up. Costs extra for the installation—you have to expect that. Especially if you want anesthetics and all that fancy stuff.

No, you don't see about it on the commercials for Friendly Loan and those. First I heard, in fact—one time my ortho-wife's boyfriend moved in and it was like sardines in our sleep booth, so I went to stay with my infra-wife, Celie. And she had a new coat, and a plastic leg to show for it. First *I* knew . . .

Yeah, I thought it was weird, too. She took me over to the loan office and showed me the vaults. You know what? There was her right leg plugged in to a *body* prosthesis. Blood circulating, the whole bit. They even hook up the nerves and *exercise* the meat. Celie had to tell them, hold it down, she couldn't keep the left one in that kind of shape. Lopsided, she should be?

Later she gave up and mortgaged the other one, too. Easier, and besides she needed to get a lot of her mother out of hock so she could be all together for the funeral.

What you mean, *whose* funeral? Her mother's—who did you think? Some folks don't seem to care any more, but decent people still like to keep things tidy.

Me? Oh, mostly just the arm—I don't believe in trying to live too high on the carcass. But—well, for one thing, the left foot, too. You didn't notice, huh? Not *bad;* right?

Well, Jesus! You expect me to scrimp on my own kid's puberty party? It set me back some. I know some creeps start the kid in hock for it, but not me.

You asked what, Leon? Really noisy down here.

Oh—is the kid a boy or a girl?

No. You ever hear of Zero Population Growth?

Yeah, I guess things *have* changed while you were up there. You notice much else new?

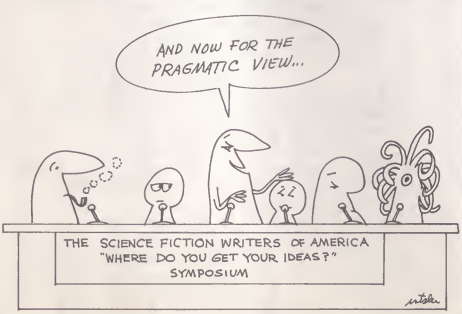
Undersea quarters? Nice, yeah, but I wouldn't if I were you. That's Loving Loans you deal with, on those.

They try harder, it says, because they're Number Two.

But you know what they want for security?

Your balls. You wouldn't like that, Leon.

I sure as hell don't. ○



MOMENT IN HISTORY

Since the launching of Sputnik I the Soviet Union has proudly displayed their space triumphs on stamps.

SOVIET SPACE STAMPS

In 1957 the Soviet Union launched the first man-made satellite, Sputnik One, and shortly after that launch letters started showing up in the Russian post with a representation of that first "fellow traveler" orbiting around earth. Since then more than two-hundred stamps or stamp blocks have been issued commemorating Soviet space successes, including stamps honoring the fathers of Russian space science, their pioneering space linkups, their lunar rover and lunar return vehicles, and their missions to Mars and Venus. Interestingly enough, several of the stamps show events which have transpired on Soviet missions, along with plans for follow-up missions.


ПОЧТА СССР 6


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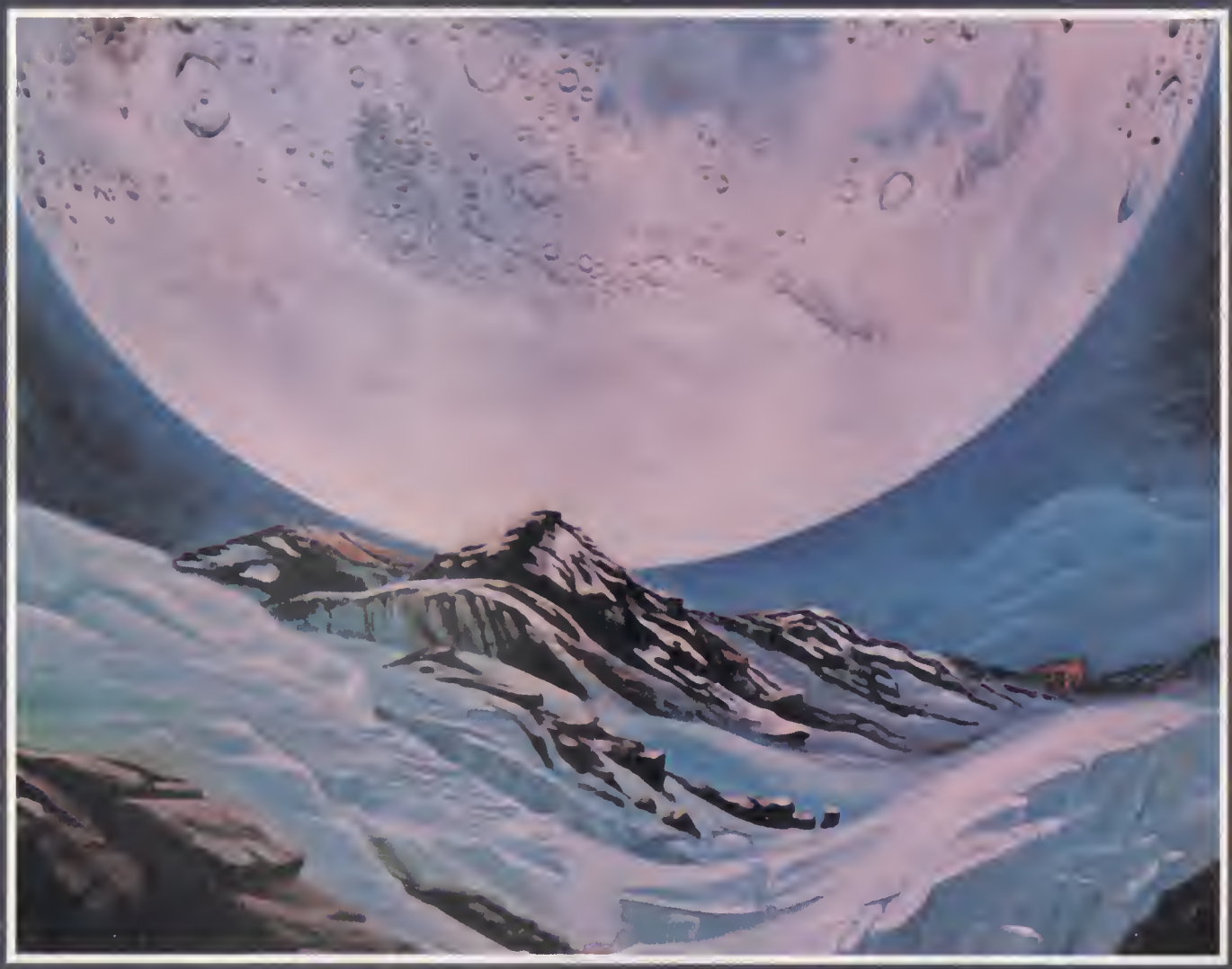

ПОЧТА СССР 10


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IN THE NEXT ISSUE OF VERTEX WE'LL FEATURE:

Part One of "Sunrise, West," an important new novella from William Carlson; A speculative look at Egypt's pyramids from a new angle; An interview with the author of "Patron of the Arts," William Rotsler; The first story from Harlan Ellison and Ed Bryant's new novelization of "The Starlost," along with comments by Ellison and the original script for the TV show by Harlan Ellison, and much more.



FALL OF TRITON